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Electrical Installations in Mines

ALTHOUGH fewer collieries are working now than five years ago, the number and h.p. of motors connected have increased appreciably. That merely shows the trend in the method of driving machinery in the most profitable pits to be the same as in other industries, but more particular tendencies are shown by the allocation of the bulk of the h.p. installed above ground in 1933 to coal-cleaning and winding plant and of a substantial proportion of the additions underground to loaders and conveyors. Another trend is the reduction in the amount of d.c. plant, again following ordinary industrial practice.

In view of the importance attached to safety in mines, the relation between the increased use of electricity and the incidence of accidents attributable to its use forms the main theme of the annual reports of Mr. J. A. B. Horsley, Electrical Inspector of Mines. In his latest survey he shows that the total number of such accidents in 1933 was no more than in 1928. Shock was responsible for about 75 per cent. of the fatal accidents and a higher proportion still of the others.

Explosions due to fire damp usually affect more people, but there is no real reason that electric-bell signalling should be under a cloud, as apparatus certified as suitable for safety-lamp mines is obtainable from several manufacturers; an anomaly that ought to be removed at once is that in some pits the electrician is not responsible for electric signalling circuits.

The greatest source of trouble in collieries, as in factories, is the portable cable and its accessories, nearly half of the fatal and more than a third of the non-fatal accidents being due to their use or misuse. A large proportion of these is caused by shock received from a conductor exposed as a result of previous injury to the cable, which seems to imply that maintenance is in many cases surprisingly perfunctory. The more extended use of flexible cable with a screen of earthed copper wires between the conductors and the sheath associated with leakage protection on the switchgear would, we believe, reduce considerably the risk of this class of accident.

Mr. Horsley goes into this aspect in a detailed manner that is justified not only by the conditions under which the majority of coal cutters are now running but also by the more extensive use of electrically operated conveyors and loaders, for which unscreened trailing cables are even more unsuitable.

The safety of the apparatus depends both upon the suitability of its design for its particular duty and upon the way in which it is used. With regard to the first, improvement during the past few years has been encouraging, and for this some credit must be given to the work carried out at the Buxton testing station.

If progress has not been so evident in the reduction of accidents due to misuse, negligence and inadequate organisation, that is largely because a status commensurate with his responsibilities is not everywhere accorded to the mining electrical engineer.

An Amended Grid Scheme

THE modification to the South-West England and South Wales Scheme which was published this week by the Central Electricity Board does little more than give effect to and regularise a position that was contemplated under the provisional scheme of the Electricity Commissioners in January, 1930. It provides that seven of the eleven stations, formerly included for operation under "temporary arrangements," shall be permanently "selected," bringing the total of the selected stations to fourteen—a number that seems more appropriate to the size of the district. The situation of the additional plant will make the scheme somewhat less lop-sided, geographically speaking, especially as the growth of load has been more rapid recently in the S.W. England section than in South Wales. The Tir John North station at Swansea will be ready for work next year, but the construction of the other new station on Southampton Water (which was expected to be required by 1938-39) is to

be postponed. As the load has doubled in the regional area during the last seven years, we hope that events will justify adherence to the original plan with regard to the Southampton station.

The I.E.E. Wiring Rules

In an industry that fortunately develops as rapidly as ours does, it is impossible to provide for more than a few years ahead in any code of rules that has a strictly practical bearing. Thus, although the recently issued tenth edition of the Regulations for the Electrical Equipment of Buildings is so very much in advance of its predecessor published only seven years ago, we cannot assume that finality has been reached. That this is the view also of the Wiring Regulations Committee is evident from the statement in the introduction to the present edition that additions or modifications may be made to cover the use of methods, materials or appliances not provided for if they are not less safe than those now included. Mr. A. G. Bullen raises in our Correspondence columns a number of points upon which some of our readers may desire to comment. Criticism of a constructive character is always welcome.

Ten Years Young

The Electrical Association for Women is celebrating its tenth birthday shortly. It has arranged to hold an exhibition of electricity for the working woman at its headquarters in Regent Street from November 12th until the 17th, and the opening ceremony will be performed by the Marchioness of Reading. An hour or two later—that is, at 5.30 p.m. on November 12th—there will be a presentation to Miss Haslett, the Director. To Mrs. G. Z. de Ferranti will fall this very pleasing act on behalf of the members. The exhibition will comprise models of electric working-class kitchens that exist in various parts of London, and each afternoon there will be short lectures on some aspect or other of woman's electrical needs in the modern household.

Fair Trading Policy

What the attitude of the I.M.E.A. would be toward the proposed Fair Trading Policy which received so much attention early in the year has been a matter of great consequence from the beginning of the deliberations. Why an important statement on the present position should be accorded merely the necessarily restricted publicity that is possible through the medium of the *Journal* of the Association is hard to understand. It is well known that some associations publish organs of their own to raise revenue to meet their working expenses, and they mistakenly limit the circulation to their members and a privileged few, of news which actually is of great interest outside the charmed circle. Working expense considerations, however, hardly apply to the case of so successful an organisation as the I.M.E.A., and we should have supposed that the Council would have regarded anything relating to Fair Trading Policy as matter of common interest.

Municipalities Want Special Terms

The officially published statement, summarised briefly, is as follows:—When the Council considered the question of becoming signatories to the Policy it was unanimously opposed to that course. Subsequently the matter has been further discussed informally between an I.M.E.A. deputation and representatives of the Fair Trading Council. The I.M.E.A. took exception to the classification of buyers in the original proposals, where the electricity supply authorities were bracketed with electrical contractors and retailers and allowed full trade discount. It was strongly contended that as the I.M.E.A. was undoubtedly as large a buyer as the wholesalers its discount terms should not be less than those allowed to the latter. Further argument adduced was that in trading with a municipality, manufacturers obtained an excellent security against bad debts. The opinion is strongly held by the I.M.E.A. that electricity supply authorities should be classified in a separate category and given special terms, in addition to which they should also be entitled to quantity discounts. The latest development appears to be the expression of the Council, at a meeting held in September, of agreement with the principle of fair trading, and of willingness to become signatories to the Policy, subject to the special terms being satisfactory to them. There will be further negotiations with a view to these terms being clearly defined. This stage was more or less inevitable if application of the Fair Trading Policy was to become possible on any large scale.

Single- or Three-phase?

A South African correspondent informs us that the Electricity Supply Regulations in Cape Town are to be amended so as to give effect in law to the practice of the municipality of wiring for three-phase four-wire supplies all domestic premises having four or more rooms or connected loads exceeding 4.4 kW. This represents a tendency opposite to that of the new Electricity Supply Regulations for Great Britain, Section 28 (a) of which prohibits the use of a four-wire service unless more than 15 kW is installed. A strict interpretation would in many cases prevent the adoption of the sound principle that the neutral wire should carry a minimum of current, and would reduce the value of a three-phase as compared with a single-phase system. In many areas four-wire services are common for relatively small installations; thus we drew attention a couple of years ago to the practice at Wolverhampton, where over 30,000 such services (which, incidentally, help voltage regulation by allowing load to be transferred from one phase to another) have been laid. The Commissioners are empowered to make particular regulations on any point under Section 39. Perhaps that will prove the way out of the difficulty.

Electricity for the Million

That the unhappy legacy of a 100-V system need be no obstacle to progress is shown by the vigorous policy being pursued in Hammersmith, where the halfpenny unit rate is being introduced in a two-part domestic tariff, in conjunction with the "three units for a penny" water-heating rate. This is a practical attempt to bring electricity within the reach of all, as Hammersmith (notwithstanding its new large blocks of electrified luxury flats) is not a wealthy area, and 20,000 of the 32,000 consumers are supplied under an assisted-wiring scheme, mostly through prepayment meters. Supplies to large premises are being given at 230 V, which will relieve to some extent the load on the 100-V distributors, but Mr. A. F. Harmer, the borough electrical engineer, informs us that the voltage of these is being raised to the standard as rapidly as circumstances will permit. The additional capacity on l.v. cables should be regarded as an asset in change-overs, especially if voltage-drop is taken into account, and should offset to some extent the cost of standardisation.

Liability for Safety

The liability of those who provide and fix electrical apparatus to penalties for injury to a consumer through faulty installation work is brought out in a legal case reported by us this week (p. 579), when substantial compensation was awarded to the user of a hired electric kettle. The report of the court proceedings shows that two departures from sound practice were made: (1) the metal work of the kettle was not earthed, thus permitting it to become charged at a voltage that might in certain circumstances prove dangerous; (2) the switch controlling it was inserted in the neutral conductor, which allowed the potential to remain on the metal when out of use, and would have prevented it from being switched off had this been necessary (as it often is) to release the person suffering from shock. How much simpler it would be to comply with the I.E.E. Regulations in such cases!

Laying Power Cables Under the Bed of the Avon. **(See page 565)**

1. The completed pipe line ready for launching. 2. Swinging the pipe into position. 3. The Avonmouth end of the pipe line. 4. A cable entering one of the pipes. 5. Cables in position on the Somerset side. 6. Cables crossing Portishead Dock

The Institution of Electrical Engineers

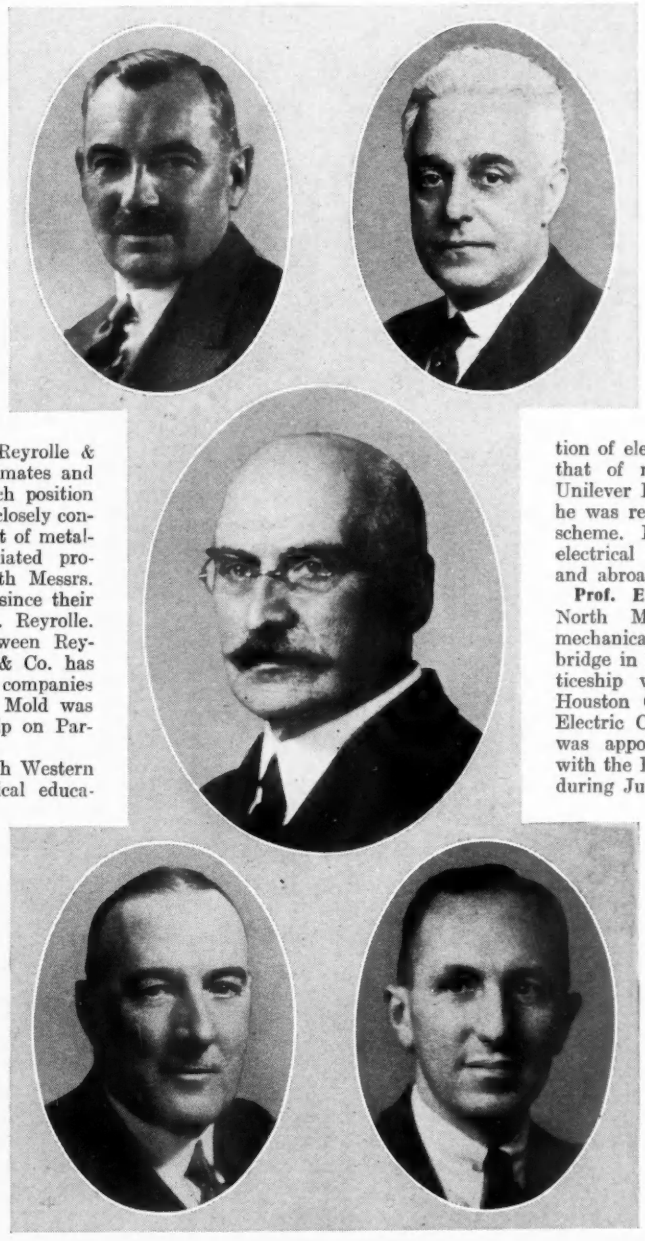
Who are the new chairmen?

LAST night the Institution opened the London proceedings of the 1934-35 session with the inaugural address of the President, Prof. W. M. Thornton.

An account of the career and activities of the president, who is so well-known as Professor of Electrical Engineering at Armstrong College, Newcastle-on-Tyne, was given in the ELECTRICAL REVIEW of June 8th (page 849). In accordance with our usual practice at the beginning of the session we provide the reader with photographs of and brief biographical notes regarding the chairmen of the various local centres, also those of the Wireless and Meter and Instrument Sections.

Capt. L. E. Mold, chairman of the North-Eastern Centre, was educated at Oxford City technical school and received his preliminary training with the Oxford Electric Light Co., under Mr. F. H. Francis. He joined the Newcastle Electric Supply Co. in 1907, on generation and distribution. In 1911 he became associated with Messrs. A. Reyrolle & Co. under Mr. Clothier. During the war he served with the Royal Engineers' Signal Service in France and Belgium, becoming Deputy Assistant Director of Signals, Fourth Army. After the war he was with the British Thomson-Houston Co. for a short period, later rejoining Messrs. A. Reyrolle & Co. as manager of the Estimates and Contracts Department, which position he still holds. He has been closely connected with the development of metal-clad switchgear and associated products, and also latterly with Messrs. J. H. Holmes & Co., Ltd., since their association with Messrs. A. Reyrolle. The recent association between Reyrolle's and C. A. Parsons & Co. has brought these Tyneside companies closely together, and Capt. Mold was appointed to a directorship on Parsons's board in January last.

Mr. G. A. Cheetham, North Western Centre, received his technical education at the Manchester College of Technology and obtained a diploma in electrical engineering and an associateship. He served his apprenticeship with Messrs. Ferranti, Ltd., with whom he later held the position of experimental engineer on meter design. In December, 1913, he joined the staff of the Metropolitan-Vickers Electrical Co., Ltd. (then the British Westinghouse Electric & Manufacturing Co., Ltd.), as engineer on instrument and meter design, becoming chief instrument designer in 1918 and chief engineer of the Instrument and Meter Department in 1920. In 1922 the company appointed him to take over the control of the manufacture of instruments and meters, in addition to the design, as superintendent and chief engineer, and in 1931 was promoted to manager of the Instrument and Meter Department. He has served on the Committee of the North Western Centre of the I.E.E. for nine years, and on the Committee of the Meter and Instrument Section for three years. He read a paper before the latter section last year on "An Approved Three-phase Three-wire Reactive Volt-ampere-hour Meter." He has served on B.S.I. Committees on Standardisation of Instruments and Meters, and has taken an active interest in international standardisation, having served on several Committees of the International Electrotechnical Commission.



Centre: Prof. W. M. Thornton (Pres.). Above: Capt. L. E. Mold (North-Eastern Centre) and Mr. G. A. Cheetham (North-Western Centre). Below: Mr. R. G. Devey (Mersey & North Wales (Liverpool) Centre) and Prof. E. L. E. Wheatcroft (North Midland Centre). *Portraits 1, 3 and 5 by Elliott & Fry)*

Mr. R. G. Devey, Mersey and North Wales (Liverpool) Centre, received his technical education at Bradford and Preston. He commenced his career with Messrs. Lister & Co., Bradford, under Mr. E. Preece, at that time chief engineer of the company, for whom he electrified mills at Bradford and Nuneaton, thus obtaining experience in textile electrical engineering. When the English Electric Manufacturing Co. built its works at Preston he was appointed works electrical engineer, in which position he gained considerable experience in the manufacture of electrical plant from turbo-generators and converting plant to motors. He carried out several industrial contracts for the company which became Dick Kerr & Co., and later became a constituent of the present English Electric Co., Ltd. In 1913 he was appointed to his present position as chief electrical engineer with Messrs. Lever Bros., Port Sunlight, who generate their own power for supply to the works plant, docks and estate, the consumption of electricity being greater than that of many large towns. When Unilever House, London, was erected, he was responsible for the electrical scheme. He has designed many works electrical installations both at home and abroad.

Prof. E. L. E. Wheatcroft, M.A., North Midland Centre, gained a mechanical sciences tripos at Cambridge in 1921, and served his apprenticeship with the British Thomson-Houston Co., Ltd., and the General Electric Co. of America. In 1924 he was appointed switchboard engineer with the B.T.H. Co. at Willesden, and during June and July, 1926, served as calculation engineer with the Commonwealth Power Corporation, Jackson, Michigan, U.S.A. He returned to this country in October of the same year to take up his present position as Professor of Electrical Engineering at the University of Leeds.

Mr. W. Burton, South Midland Centre, was educated at Winnington School, Northwich, and the Central High School, Manchester. From 1903 to 1906 he was with the National Telephone Co., Liverpool, and during the next three years he studied at the University of Liverpool, where he obtained the M.Eng. degree. He joined Messrs. Ferranti, Ltd., in 1909, and while he was with this company he was engaged in the Switchgear and Transformer Departments until the war, when he joined the Royal Engineers, with whom he served from 1914 to 1919. On leaving the Service he joined the Birmingham and Midland Motor Omnibus Co., and was engaged on petrol electric equipments. In 1924 he took up the position of technical engineer with the Shropshire, Worcestershire and Staffordshire Electric Power Co. He was appointed to his present position of technical engineer with Edmundson's Electricity Corporation, Ltd., at the beginning

of the current year. He is an associate member of the Institution of Automobile Engineers and an associate of the American Institute of Electrical Engineers.

Mr. R. Hodge, Western Centre, was educated at Manchester Grammar School and the College of Technology, Manchester. He served his apprenticeship with the British Westinghouse Electric Co., Ltd., Manchester; he has since been on the commercial side of the Metropolitan-Vickers Electrical Co., Ltd., and for the last ten years has been in Bristol.

Mr. R. G. Allen, Irish Centre, received his training at the Royal Dockyard, Portsmouth, and gained a Whitworth Exhibition and a Royal Exhibition. He graduated as A.R.C.Sc.I. in applied physics at the Royal College of Science, Dublin, and later obtained the B.Sc. (Hons.) degree in engineering, London University. For a short period he acted as demonstrator to Sir William Barrett at the College of Science, Dublin, and as demonstrator to Prof. Worthington at Keyham College, Devonport. He also assisted Prof. Barrett and Mr. Brown in their researches on the magnetic qualities of iron supplied by Sir Robert Hadfield, of Sheffield. He has read several papers before Royal Dublin Society on the insulation properties of porcelain, vulcanised fibre and erinoid, and is the author of a work entitled "Electrical Testing." During the past twelve years he has been head of the Electrical Engineering Section of University College, Dublin, and is also associated with other educational institutions.

Prof. J. T. MacGregor-Morris (Meter & Instrument Section) (Lafayette); Mr. W. Burton (South Midland Centre) (Elliott & Fry); Mr. S. R. Mullard (Wireless Section)

Prof. F. G. Baily, M.A., F.R.S.E., Scottish Centre, was educated at the University College School, London, and the Mining College, Germany, and obtained the Natural Science Tripos (first class), parts I and II, at Cambridge. In 1889 he served as a pupil with Messrs. James Simpson & Co., pump makers, and during the following two years was with Messrs. Siemens Bros. & Co., Woolwich. In 1892 he entered the Department of Electrotechnics, University College, Liverpool, under Prof. (now Sir Oliver) Lodge, where he remained for three years. He was appointed Professor of Electrical Engineering at the Heriot-Watt College, Edinburgh, retiring from that position in 1933. He has carried out a considerable amount of consulting work, particularly in relation to electric lighting and power in country houses, asylums, hospitals, factories, &c. During the war he was with the Ministry of Munitions and the War Office. He has carried out researches on hysteresis in rotating and alternating magnetic fields, terrestrial magnetism, and earth currents, and in many other branches. He became a member of the I.E.E. in 1900; he is a past-chairman of the Glasgow Section (1907-8) and was vice-chairman of the Scottish Centre last year. He is president of the Engineering Section of the British Association and is also associated with a number of Scottish associations.

Prof. J. T. MacGregor-Morris, chairman of the Meter and Instrument Section, is University Professor of Electrical Engineering at the East London College. He was educated privately and at University College, London. From 1894 to 1898 he was assistant to Professor Fleming at University College. He was president of the Old Students' Association, University College, in 1907-8, and president of the O.S.A., East London College, in 1925-26. He has specialised in subjects connected with illumination. In June, 1915, he carried out extensive experiments with Mr. A. F. Sykes in submarine detection, which resulted in the production of a directional hydrophone which was largely used during the war. He is also the inventor of a portable direct-reading anemometer. During the years 1925-28 he was director of the Electrical Engineering Section of the Summer School for Engineering Teachers, and in 1928 he was the I.E.E. delegate at the International Commission on Illumination in America. Prof. MacGregor-Morris is the author of many papers read before scientific societies and published in the technical Press on electric incandescent lamps, arc lamps and illumination generally. His literary contributions also include papers on an accurate method of magnetic testing, the electrical measurement of wind velocity, domestic electric cooking and heating, an anemometer for use in coal mines, and on other subjects.

Mr. S. R. Mullard, M.B.E., the new chairman of the Wireless Section, is chairman of the Mullard Wireless Service Co., Ltd., and a director of the Mullard Radio Valve Co., Ltd. From 1910-15 he was head of the Research Department of the Edison Swan Electric Co., Ltd., and during the war was lieut. R.N.V.R. and capt. R.A.F. He founded the Mullard companies after the war. He has been vice-president of the Radio Manufacturers' Association since 1928.

Mr. R. Hodge (Western Centre); Mr. R. G. Allen (Irish Centre); Prof. F. G. Baily (Scottish Centre)

The I.E.E. Programme

THE programme of London meetings of the Institution of Electrical Engineers for the first half of the session, 1934-35, has now been issued. Prof. Thornton delivered his inaugural address last night (Thursday), and the other meetings arranged are as follows: November 8th: "Hydro-Electric Development in Great Britain, with special reference to the Works of the Grampian Electricity Supply Co.," by Messrs. A. S. Valentine and E. M. Bergstrom. November 22nd: "Generation Distribution, and Use of Electricity on Board Ship," by Messrs. C. W. Saunders, H. W. Wilson, and R. G. Jakeman. December 6th: "A Critical Examination of the present practice relating to the Electrical Warming and Air-Conditioning of, and the Supply of Hot Water to, the Larger Buildings," by Messrs. R. Grierson and D. Betts. December 20th: "The Organisation of Electricity Supply in New Zealand," by Mr. F. T. M. Kissel (to be read by Mr. W. P. Ganvain—paper provided by the Transmission Section). January 10th: "Electrical Developments in the U.S.S.R.," by Mr. A. Monkhouse. January 17th: Joint meeting with the Institute of Fuel (particulars to be announced later). January 24th: "Electrical Control of Road Traffic by Vehicle Actuation," by Mr. T. P. Preist. February 7th: Annual dinner at Grosvenor House, Park Lane, W. The annual Electrical Engineers' Ball will be held at Grosvenor House on the following evening. Sir William H. Bragg will deliver the twenty-sixth Kelvin Lecture on May 2nd, and the annual general meeting will be held on May 16th.

Cable Fault Localisation.

By A. G. Powell, A.M.I.E.E.

THE Murray loop method is quite reliable for determining the position of earth faults and short-circuits if a well-insulated conductor is available for the completion of the loop, as is usually the case when only one core of a cable is involved. The connections are as shown in fig. 1. The remote ends of the good and faulty conductors being shorted, adjustment of the resistance slider produces a condition in which there is no deflection of the galvanometer when the key is depressed. The resistance of the faulty conductor from the testing end A to the fault x will then be AR/b.

It is usual to arrange the variable resistance to be direct-reading, *i.e.*, when the two conductors forming the loop are of the same cross-section and the resistance of the connections is negligible, the variable resistance can be taken as representing the total length of the loop, and will be equivalent to the actual distance of the fault from the testing end.

In the event of the cable under test being composed of lengths having varying cross-sections the length of each portion is generally converted to an "equivalent" length of conductor (a length having a similar resistance) of the same area

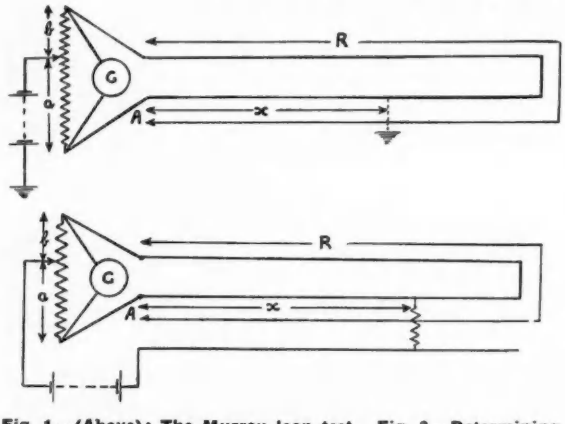


Fig. 1.—(Above): The Murray loop test. Fig. 2.—Determining the position of a short-circuit between cores

as the faulty section. The resistance of the instrument leads, if appreciable as may be the case when the leads are long, must also be taken into account. If the cable under test is subjected to widely varying temperatures along its length, correction for this should be applied.

For determining the position of a short-circuit between cores the connections of the foregoing test are modified as shown in fig. 2, and the distance x of the fault from the testing end A is AR/b as before.

In cases in which the fault to earth involves all the conductors of a cable and there is no available sound conductor to complete the loop, this method is applicable to locate the fault position. An insulation test is made of all the conductors, and the core having the highest resistance to earth is looped with that having the lowest, the connections being as in fig. 3.

It is possible to use only one test set, but as it is preferable to take readings alternately from each end as quickly as possible it is advisable to employ two sets, the slide wires having the same resistance. The requisite position of the switches while readings are being taken from either end is

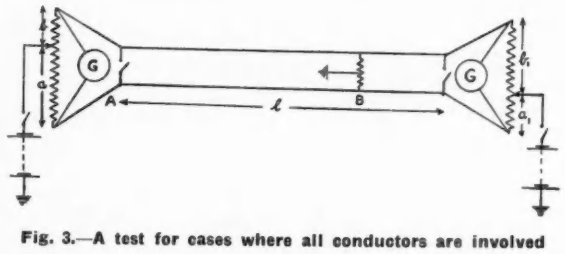


Fig. 3.—A test for cases where all conductors are involved

apparent from the diagram. The distance of the fault from the end A will be $(b_1-a_1)l/(b_1-a_1)\ (b-a)$, where l equals the length of cable from end to end.

The locating of high resistance faults, such as may cause trouble in the case of extra-high-voltage cables, is somewhat difficult by ordinary methods. The practice of "burning out" the fault by repeatedly switching in the faulty feeder until the fault resistance becomes sufficiently low for reliable readings to be taken is usually deprecated on the ground that, while the fault is momentarily broken down, it may seal up again before it is possible to make any measurements.

The very high charging current taken by a long length of high-voltage cable is also an objection to the use of a.c. to break down the fault. The employment of high-voltage

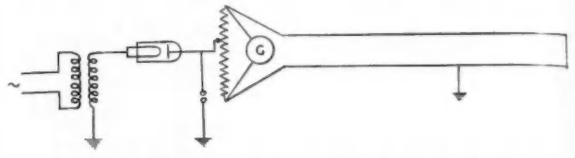


Fig. 4.—Method of locating high resistance faults

d.c. test sets overcomes these difficulties, enabling the fault to be satisfactorily broken down and the test instruments to be left connected in circuit during this period, so that the localisation tests can be made with the minimum of delay after the fault resistance has been reduced to a sufficiently low value.

A steady d.c. applied to the high resistance fault will gradually carbonise the paper at the affected point and establish a good fault for localisation. The high voltage generator consists of a step-up transformer with valve rectifier, and voltages in the region of 150 kV are common.

When the fault has a quick recovery characteristic it may be necessary to actually apply a high-voltage testing current in place of the usual battery, it being essential in such circumstances to modify the usual apparatus accordingly. Both slide wire and galvanometer must be well insulated and the latter mounted on an insulating stand. A convenient method is to stretch the slide wire on insulators, the sliding contact being adjusted by means of an insulated rod.

The general arrangement is shown in fig. 4, the spark gap being included as a precautionary measure against a possible sudden increase in voltage due to the fault clearing itself while the test is in progress. The location test is made in the usual manner after the fault resistance has settled to a sufficiently stable value to enable a sharp balance to be obtained on the galvanometer.

Where the resistance of the fault is low compared with that of the voltmeter or galvanometer employed, the potential drop method is capable of fairly accurate results, provided also that there is present no e.m.f. due to electrolytic action at the fault.

The voltmeter or galvanometer G (fig. 5) should be of high resistance, and the faulty cable is connected to a sound length

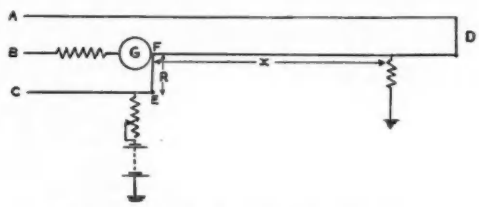


Fig. 5.—The potential drop method

AD at D and to a short length of cable FE. Next C and B are connected and the galvanometer reading v_1 taken; then A and B are connected and the second reading v_2 taken. The resistance of the damaged cable to the fault is then Rv_2/v_1 and, as the resistance R is known, the actual distance of the fault from the testing end may be determined.

In some cases when an open circuit occurs the position of the fault can be located by the simple comparison of the capacity of the faulty conductor up to the break with that of a known length of sound cable. The faulty conductor is charged and then discharged through a ballistic galvanometer, and this reading is called d_1. The deflection when the sound length is similarly charged and discharged is d_2. The distance to the break is then ld_1/d_2, where l is the length of sound cable employed. This method is liable to serious error on account of the leakage which may occur, and it is therefore necessary to ascertain that the insulation to earth is sufficiently high to render negligible this possible source of error.

Similarly, when it is possible to make measurements from both ends of the cable, the capacitance of the cable from each end to the fault may be determined. The distance of the fault from end A is then $C_1/C_1+C_2\times l$, where C_1 is the capacity from the end A and C_2 that from the other end, l being the length of the cable.

The development of the a.c. capacity bridge in the field of cable fault localisation has been made with a view to rendering this instrument suitable for rapid determination and many methods and variations are possible in this direction.

Crossing the Avon

The Bristol Corporation's Portishead-Avonmouth extension

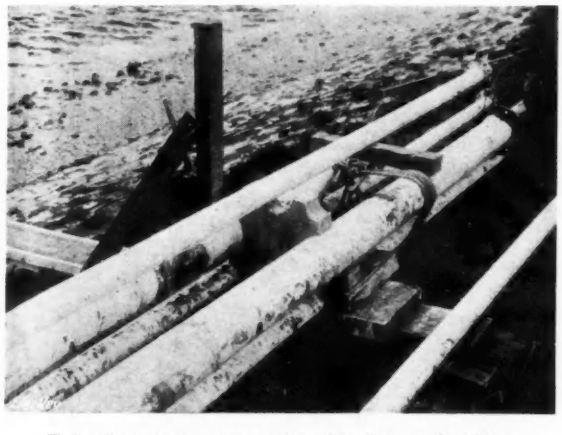
THE Bristol Corporation's main supply to the Avonmouth Docks area has hitherto been given by 11-kV feeders originally taken from the Bristol (Feeder Road) generating station over a route length of approximately 8¼ miles.

In 1929 this station was augmented by the new capital station constructed at Portishead, thirteen miles from Bristol, adjacent to the River Severn. Supply in bulk is now delivered in the reverse direction to Bristol by six 33-kV three-phase feeders, each capable of delivering continuously 10,000 kW at 0.8 p.f.

Consideration of the development of the general demand on the Gloucester side of the Avon, in association with new demand at Avonmouth Docks, indicated an extension of the 33-kV feeder system as best suited to meet the anticipated expansion. An immediate installation of three direct feeders and associated pilots from Portishead to Avonmouth was therefore put in hand at the beginning of the year, and the work was entrusted to Messrs. Siemens Brothers & Co., Ltd.

The cables are of the "H" type, embodying the radial stress principle, each phase having a sectional area of 0.15 sq. in. Each conductor is insulated to the full radial thickness necessary to obtain the requisite potential gradient and is finished off with a metallic screen 1 mil thick. Three such conductors are then laid up with their outer foil surfaces in contact, wormed to a circular cross section, and bound overall with a strong textile tape interwoven with fine copper wires.

After impregnation, the lead sheath is applied directly over the binding tape; the copper wires in the latter maintain metallic contact between the screens and the lead sheath,



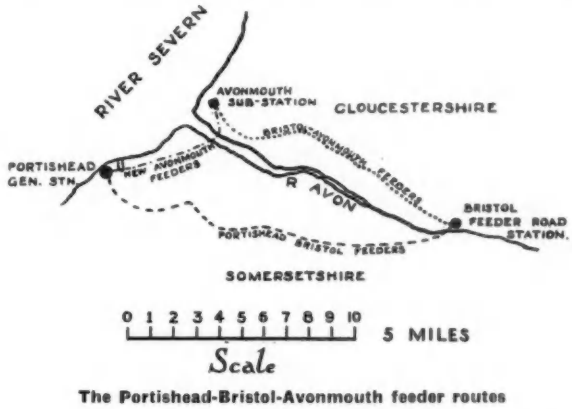
Tubes in process of assembly showing wood spider

with the result that the outer surfaces of the insulating walls of each core are maintained at earth potential. The metal screen, while of sufficient cross-section to carry the minute displacement currents required to maintain the core surfaces at equal potential, has a resistance high enough to reduce induced electromagnetic currents to negligible proportions.

The mechanical protection of the lead-covered cable for laying direct in the ground is provided for by an outer covering of two oiled papers between compound and a layer of tarred jute, then a sheathing of 0.144 in. galvanised iron wires, with a final outer covering of two layers of jute yarn thoroughly compounded. These cables are exactly similar to the Portishead-Bristol feeders previously referred to which were manufactured and laid by the same company in 1927 and 1928.

In the absence of any direct highway between Portishead and Avonmouth a practically straight run across country was chosen, the route for most of its 4¼ miles following closely the 132-kV grid line of the Central Electricity Board between Portishead and Gloucester. For the negotiation of Portishead Dock crossing advantage was taken of a recess existing in the masonry sides and bottom of the main entrance lock, in which the feeders and pilots were housed in multiple way cleats of special design.

The crossing of the River Avon at the other end of the



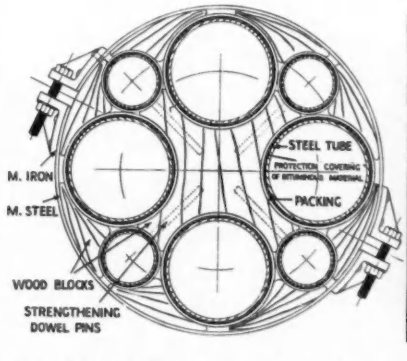
The Portishead-Bristol-Avonmouth feeder routes

route was a problem of considerable difficulty. At this point the river width between banks is 800 ft., and the tidal range is 40.4 ft. for mean h.w. spring tides and 21.8 ft. for mean l.w. neap tides. To ensure safe navigation, the Conservancy Committee required the cables to be laid 9 ft. below the river bed, and in view of the costly nature of dredging operations for a trench of this depth in a river bed subject to rapid tidal silting it was decided to install in the same trench two additional feeders and pilots, making five sets (ten cables) in all. To obtain suitable positions for the closing joints on the banks, a continuous length of 1,200 ft. for the river cables was necessary.

An alternative proposal of Messrs. Siemens was to install a multiple-way pipe line in the river bed into which the cables would be drawn. The idea was to have a nest of steel tubes assembled and afloat in readiness to be sunk into the trench as soon as dredging operations were completed, thus reducing the time for silting-up to the minimum. This scheme was developed in detail in collaboration with the British Mannesman Tube Co., Ltd., and Messrs. T. R. Brown & Sons, of Bristol, appointed by the Corporation to carry out the river work.

The total length of pipe required to be installed was 900 ft., and in order to reduce the length of assembled pipe line to be handled in the tide-way to manageable dimensions, the crossing was divided into three sections. By submerging the middle section at dead neap tide, the ends were awash at low water; during the succeeding fourteen days the pipe ends were exposed twice daily, which enabled the shore sections to be laid into position and coupled to the mid-stream section.

British Mannesman seamless steel tubes with long inserted joints were selected for the cable ways, of 6 in. bore for each feeder and 3 in. for each pilot. The tubes were manufactured in lengths up to 50 ft. and were protected externally by the manufacturers' patent system, which consists of a heavy sheath of bituminous material, ⅛ in. thick, reinforced about the middle of its thickness by a layer of jute cloth. The mid-stream section was arranged in circular formation on soft wood spiders and braced together by substantial steel bands spaced at 12-ft. intervals in order to give the necessary rigidity for handling in the tide way.



Left: Cross section through mid-stream section. Right: Pipe clamp and wood float in position

A slipway was constructed on the foreshore on the Avonmouth side adjacent to the site of the crossing; the 480 ft. mid-stream section was then assembled on launching cradles carried on this slipway. The joints were welded by the oxy-

acetylene process and the external pipe protection was continued over the completed joints. Flanged joints were screwed and welded to the ends to facilitate the joining of the two shore ends. These flanged joints were closed with blanks which, in the case of the four 6-in. tubes, were fitted with cocks arranged for air discharge and admission of water to submerge the line once it was floating in position over the trench.

A 7/12 galvanised steel draw-wire was threaded through each pipe during assembly and made off to eyebolts fixed to the inside of the blank flanges. Additional buoyancy was given by means of air-tight wooden boxes lashed at intervals over the length of the section.

The whole of the operations of floating the pipes into position and submerging were directed from a single control station on the Avonmouth side in continuous direct telephone communication with the operating craft.

The pipe line was trimmed on the line of sights fixed on shore for the purpose, the floats were cut away, the cocks opened, and the nest gradually settled down, still controlled by hawsers to lighters, the lengths of which were adjusted to bring the pipes into true position in the bottom of the trench. The position of the pipe line in the trench was checked by a diver at low water and found to be correct.

Connecting the Shore Ends

For the Avonmouth shore section, 125 ft. in length, each of the cable-ways was separately assembled on the bank and fitted with its flange joint for coupling to the mid-stream section. These assembled lengths were put into position individually as the ends of the mid-stream section were exposed by the falling tide and flanges bolted up. The pipes were laid so as to gradually change the formation of the nest from circular in the mid-stream section to flat in the horizontal plane ashore to match the normal formation of the land cables in their trenches.

A similar procedure was carried out in the case of the Somerset shore end, 295 ft. long, except that the length was divided into three sections for convenience of handling, and closing joints were welded, after the pipes were in position in the trench. The pipe ends were terminated in small manholes provided for access and sealing purposes only, no joints being housed in them.

On completion of the whole line, a close fitting circular duct brush was drawn through each pipe in both directions to remove possible accumulation of foreign matter and also the river water admitted during submersion. The pipes were then flushed through with fresh water and were ready to receive the cables.

The Make-up of the Cables

The feeder cables were specially designed for the river crossing. The lead-cased core is exactly similar to that employed for the normal land type. Over this was laid a special protective covering of reinforced cotton tape, and a continuous tube of rubber. Next came a layer of tarred jute yarn to provide a bedding for the sheathing of 37/0.280 g.s. wires, the cable being finished overall with two layers of extra strong yarn, suitably compounded. The overall diameter of the cable is 4.19 in. and the net weight of each length of 400 yards is 13 tons.

The ends of the cables were prepared for drawing in by turning alternative sheathing wires round the pin of a 10-ton shackle and lap welding each to its neighbour to form a loop. Precautions were taken to adjust the length of each loop to distribute the tension evenly round the sheathing. A cone butting on the end of the lead-cased core was fitted under the sheathing wires to relieve the lead from the crushing pressure of the wires when drawing in. As a further precaution a wire serving was applied to the first 10 ft. of the cable to support the sheathing wires and protect the outer serving against abrasion during its passage through the pipe. The drawing in of the cables was effected without any difficulty, the maximum pull registered being 58 cwt.

The I.E.C. Prague Meeting

AT the meetings of six of the Advisory Committees of the International Electrotechnical Commission, which were held in Prague during the week commencing October 8th, sixteen countries were represented, the total number of delegates being 115. The largest national delegation was from Great Britain, and comprised twenty-five members appointed by the Electrical Industry Committee of the British Standards Institution, Mr. Ll. B. Atkinson and Mr. W. B. Woodhouse acting as chief delegates. The second largest delegation was from Germany, with fifteen members.

The Committee of Action (executive) decided to hold a plenary meeting of the I.E.C. at The Hague and in Brussels in the middle of June, 1935, after which the results of the work done by the Advisory Committees since the last plenary meeting will be published as I.E.C. standards. The three years' interval between plenary meetings is to be reverted to. It was decided to set up an Advisory Committee on Electrical Accessories, and Dr. Van Staveren (Holland) was invited to act as its first chairman.

At the request of the C.C.I.F. the I.E.C. has decided to take the initiative in convening an international conference to discuss the international standardisation of acoustical terms and definitions. Also an Advisory Committee on the Rating of Rectifiers is being formed at the request of the Swedish National Committee. The Advisory Committee on Regulations for the Electrical Equipment of Ships has been reconstituted and the German National Committee has undertaken to act as secretariat.

Advisory Committee No. 2, Rating of Electrical Machinery, is revising I.E.C. publication 34, Rules for Electrical Machinery (including transformers).

The British delegation's comprehensive proposals covering all the dielectric tests were accepted practically in entirety. Regarding the use of sphere-gaps for high-voltage measurements, it was decided to set up a sub-committee of experts to draft a report with a view to the early publication of international standard calibrations.

Advisory Committee No. 3, Graphical Symbols, has prepared a single list of symbols for electric traction which is to be circulated to the National Committees for approval before publication as an I.E.C. standard.

Advisory Committee No. 6, Lamp Caps and Holders, made recommendations which were adopted with minor modifications. They cover the dimensions essential from the interchangeability point of view for caps and holders of the bayonet and screw types, which are to all intents and purposes identical with those already standardised in Britain (B.S. Specifications Nos. 52 and 98). The direction of the tolerances in gauge construction is still under discussion.

Advisory Committee No. 8, Voltages and High-voltage Insulators, has revised the list of I.E.C. nominal voltages by the inclusion of a standard series up to 100 V (2, 4, 6, 12, 24, 32, 40, 60, 72, 80 and 100 V). A series of d.c. voltages for traction has been agreed upon (550, 750, 1,200, 2,400, 3,000, 3,600). The lists of medium and high voltages remain unaltered, but in the list of extra-high voltages the British grid value of 120/132 kV has been added, together with 400/440 kV. A series of standard current ratings for electrical apparatus has also been established, and a draft international specification for the testing of overhead line insulators is to be circulated to the National Committees for further consideration.

Advisory Committee No. 17, Switchgear, reached tentative agreement regarding the colouring of indicating lamps and the direction of motion of switch handles. A complete specification for the rating and performance of circuit-breakers was submitted by the British delegation, and is to be considered by a committee of experts.

Cable-testing Recommendations

Advisory Committee No. 20, Electric Cables, has had the advantage of the recommendations of a committee set up some years ago by the Paris High Tension Conference, and a skeleton specification had been prepared for the testing of lead-covered paper-insulated cables for nominal voltages of 10 to 66 kV. Two definitions which have been established are that (i) the "nominal" voltage of a cable is that between phases of the system for which the cable is intended, and (ii) the "rated" voltages are those for which the different parts of the cable dielectric have to be designed.

Agreement has now been reached that the measured d.c. resistance of the conductor in a completed cable, corrected to 20 deg. C., shall not exceed by more than four per cent. the value calculated on the basis of a solid conductor having a sectional area equal to the nominal sectional area and having a volume resistivity equal to that of standard annealed copper, or standard annealed aluminium, as defined by the I.E.C. (*i.e.*, 17.24 ohm mm.²/km. for copper and 27.81 ohm mm.²/km. for aluminium).

The Committee agreed that it was unnecessary to lay down an international test for insulation resistance or for electrostatic capacity. A test for dielectric losses at ambient temperature has been approved, and agreement was reached regarding high-voltage tests.

New South African Schemes. By E. C. Klopper, Assoc.(S.A.)I.E.E.

Meeting a continually expanding demand

SOME time ago, writing in the Electrical Review, I pointed out that many important extensions and new undertakings in South Africa had to be deferred on account of stringent money conditions. Now, however, things have so improved that public bodies can obtain the necessary capital without difficulty. Probably at no other time has the number of power schemes undertaken been greater than at present, and millions of pounds are being spent.

The principal projects of the Electricity Supply Commission, completed or in hand, comprise the installation of four 80,000-lb. boilers in the Witbank power station, two Parsons 20,000-kW, 33-kV turbo alternators in the Salt River station, and extensions to the transmission system, with the provision of an additional traction sub-station for the supply to the Railway Administration for suburban railway electrification.

In Durban the erection of a 20,000-kW Parsons turbo-alternator was completed early this year. Along the Natal central route important extensions to the transmission systems are being carried out, with the addition of two further sub-stations for the supply of power for electric traction.

The demand for power on the Rand is increasing so rapidly that the requirements still to be met are no less than 70,000 kW. This expansion has led to important extension schemes including the erection, in conjunction with the Electricity Supply Commission, of the new Klip station. The first machines in this station will comprise three 32,500-kW, Metro-Vick sets and Babcock and Wilcox boilers, and the ultimate capacity is to be 350,000 kW. It is expected that the station will be on load within twelve months.

The present installed plant capacity of the various stations supplying the system of the Victoria Falls & Transvaal Power Co. Ltd., is well over 500,000 h.p. and that of the air compressing plant feeding the air system close upon 120,000 h.p. Sales of electricity and compressed air last year amounted to 1,603 million kWh, an increase compared with 1932 of just over 100 million kWh. This year's output promises to eclipse all previous records. In addition, various individual mines which generate their own power are enlarging their plants.

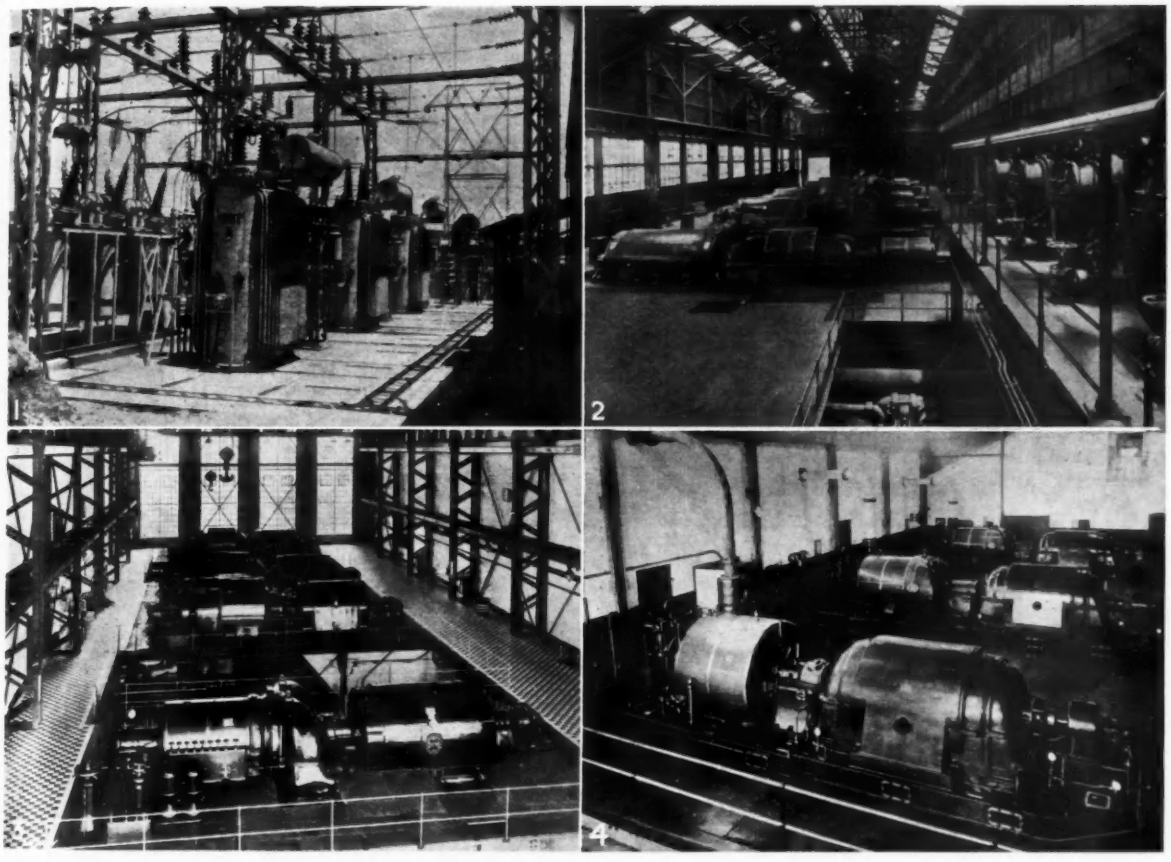
At the Randfontein Estates, whose power needs amount to over 200 million kWh per annum, a further 24,000 kW (m.c.r.) turbo-generator was installed early this year. It was supplied and put into commission in record time by the Metropolitan-Vickers Electrical Export Co., Ltd. The turbine is of the two-cylinder type running at 3,000 r.p.m., with steam conditions of 160 lb. per sq. in. and 650 deg. F. Feed heating to 190 deg. F. is provided for by means of bled steam.

In Johannesburg the remaining portion of the £500,000 scheme which was expected to be finally completed in 1944 will be put in hand forthwith. The output for 1933-34 was 49.7 million kWh, having practically trebled in ten years. When the future requirements were calculated in 1926 it was estimated that the demand in 1935 would be 30,000 kW and the output 100 million kWh. The peak load this year up to a recent date was 44,000 kW. The number of consumers connected to the mains at the end of last April was 38,705, the average annual increase for the last five years being about 1,200.

The distribution system covers practically every suburb in the municipal area of 83½ sq. miles. There are seven convertor sub-stations; fifty-two brick transformer sub-stations; 123 transformer kiosks; and 19,300 public lamps illuminating 800 miles of streets. An average of 2,500 h.p. of motors per annum is being added to the mains. Electric stoves are being installed at the rate of 100 per month, and with the introduction of a rate of ½d. per kWh for domestic uses, it is expected that the coming year will see a great increase in the demand for electrical apparatus.

In Cape Town, likewise, the domestic load is showing spectacular expansion, due chiefly to an attractive hire-purchase scheme, one of the features of which is the method of connecting up cooking ranges by standard four-pin, metal-clad plug and socket outlets. Purchasers of cooking ranges can connect these appliances themselves when moving from one house to another merely by plugging the ranges into existing sockets, as they would a kettle or a radiator.

In order to secure uniformity in all installations, whether



Modern Generating Equipment in use in South Africa

1. The outdoor sub-station of the Natal Central undertaking at Estcourt. 2. A view of the Witbank power station which contains 100,000 kW of plant. 3. A section of the Congella station showing the new Parsons turbo-alternator. 4. The power house engine room of the Natal Estates, the only completely electrified sugar works in South Africa

provided under this scheme or otherwise, the Council has decided to amend the Electricity Regulations so as to require that all domestic installations shall be controlled by heavy metal-clad combined switch and distribution boards of the size and type used by the Council, and to require that all electric ranges with a loading of 3.5 kW and over shall be connected by the same type of outlets as used for ranges provided under the deferred-payment scheme.

Durban, maintaining its excellent rate of progress, is now one of the most highly electrified cities of South Africa. Pretoria is expanding rapidly, especially as production has commenced at the large Iscor Iron and Steel Works; extensions in the power station comprise a British Thomson-Houston 12,500-kW turbo alternator, with auxiliary plant (£54,770) and two 100,000-lb.-per-hr. Yarrow boilers with auxiliaries (£130,805).

Extensions in the Cape Province

In the Cape Province particularly many towns are extending or modernising their undertakings. Port Elizabeth is inquiring for a 12,500-kW turbo-alternator, boiler and auxiliaries. A new 3,000-kW machine is being installed in East London, where £50,000 is to be spent on the undertaking. At Mossel Bay the plant recently installed included one 450-b.h.p. Belliss & Morcom triple-expansion 375-r.p.m. engine and condenser, with a Lancashire Dynamo & Crypto Co. 375-kVA alternator, a 600-lb. Babcock & Wilcox boiler, with Green's economiser and two Hall feed pumps.

Additions to the switchboard consist of a generator and feeder panel supplied by A.S.E.A. As sea-water is used for circulating purposes, all parts of the condenser and pumps are constructed, as far as possible, of material which will resist the action of sea-water. In the past, water could not be pumped from the sea at certain tides, and in view of the cost of providing a suitable suction a reserve supply was maintained in the form of a warm sea-water swimming bath. This became too warm for condensing purposes, and a Ledward & Beckett spray was installed, with the result that pumping costs were reduced by 88 per cent.

Extensions at Grahamstown, completed recently at a cost of £35,000, include four Babcock & Wilcox 8,500-lb. boilers, with steam conditions of 200 lb. per sq. in and 600 deg. F.; two Belliss & Morcom steam turbo-alternators; an Erskine Heap eleven-panel 11,000-V three-phase totally enclosed switchboard; a Green's economiser, and two Sirocco induced-draught fans.

The Municipality of Oudtshoorn is to build a new station containing a 400-kW steam alternator and an 8,400-lb. boiler with economiser and induced-draught plant. The switchboard will be of the draw-out truck type. Worcester, another progressive undertaking in the Cape, is asking for a new d.c. set with geared turbine and 20,000-lb. boiler, with provision for the substitution of an a.c. for the d.c. generator. The present plant capacity is 700 kW.

At Bloemfontein it is now estimated that further additions to the generating plant will have to be carried out at a cost of £100,000. Other towns contemplating extensions or with them in hand are Klerksdorp, Benoni, Springs, Krugersdorp, Harrismith, Middelburg, Lichtenburg, Steynsdorp, Dundee, Colesburg, and Bloemhof.

The electrification of the Natal main railway line is at last to be completed from Durban to the border town of Volksrust, with a branch line from Ladysmith to Harrismith in the Free State. The total length of the electrified route will then be 400 miles, or nearly 600 track miles, which will be the second longest section so operated in the world and the longest in the British Commonwealth.

The 88-kV transmission line will be extended by the Railways Administration along the track from the present terminus at Cato Ridge to the coast, a distance of 44 miles, electricity being obtained as hitherto from the Electricity Supply Commission's power station at Colenso. Four or five substations will be required *en route*, and conversion from a.c. to d.c. is to be carried out by mercury-arc rectifiers instead of motor generators as at present.

Rhodesian Projects

In Lusaka, the new capital of Northern Rhodesia, an entirely new station is being built at a cost of £58,000. It will be similar to that installed by the Government at Ndola and will contain two 5,000-lb. Yarrow boilers (steam conditions 275 lb. per sq. in. and 750 deg. F.), with stokers of the Underfeed Co's "louvre" type and two Metropolitan-Vickers 300-kW turbo-alternators.

The turbines will be of the impulse type, running at 6,000 r.p.m. stepped down through double-helical gearing to 1,000 r.p.m. The circulating water pump will be driven from an extended rotor shaft and will work in conjunction with a spray cooling plant and ponds. A Belliss & Morcom 64-kW oil-engine house set is also to be installed. The switchboard will be of the B.T.-H. slate-panel type. Transmission and distribution will be carried out by overhead lines, the 3.3-kV supply being stepped down in the town to 440/230 V.

Salisbury recently added a B.T.-H. 3,000-kW machine and a B. & W. boiler, making the installed capacity 6,000 kW. During the past year five million kWh was sold, with a m.d. of over 2,000 kW. Although coal costs 27s. per ton, the domestic room tariff includes a secondary rate of 0.9d. per kWh, and supply is given over a six-mile radius. The coal consumption averages slightly under 1.8 lb. of coal per kWh generated.

Negotiations are now in progress between the Rhodesia Railways and the Bulawayo Town Council for supplying the railways in Bulawayo, electricity for which is now generated at the railway power station. The new 5,000-kW generator to be installed shortly at a cost of £36,000 will cater for demands likely to arise within the next few years.

The Revised South-West England Scheme

THE South-West England and South Wales Scheme covers an area of 17,090 sq. miles, including South Wales, the counties of Hereford, Monmouth, Somerset, Devon, Cornwall, Dorset, Wiltshire and Southampton, and parts of the counties of Berkshire, Gloucester, Oxford and West Sussex and the Isle of Wight. It is nearly twice the size of any other regional area and represents approximately 25 per cent. of the total area of the country for which schemes have been adopted by the Central Electricity Board. Much of the area, however, is sparsely populated agricultural territory, and the population of 6,298,000 is only about 14 per cent. of the population of Great Britain.

Mr. J. W. Beauchamp, the Central Board's engineer for the S.W. England and S. Wales District

Industrial centres include the coal-mining, tinplate and iron and steel smelting districts in South Wales, the china clay and tin-mining districts in Cornwall, and the seaports extending along the south coast from Portsmouth to Falmouth and in the Bristol Channel. The population is concentrated chiefly in a few large centres.

The interconnection of the generating stations in these three widely separated districts has necessitated the provision by the Board of 606 miles of primary transmission lines, being approximately 21 per cent. of the total primary lines in the country. There are also 112 miles of secondary transmission lines in the area. During 1933 the amount of electricity generated by authorised undertakers within the area exceeded 1,000,000,000 kWh.

More "Selected" Stations

The original scheme (ELECTRICAL REVIEW, January 17th, 1930) provided for the selection of only seven existing generating stations, *viz.*, Cardiff, Hayle (Cornwall E.P. Co.), Newport, Portishead (Bristol), Southampton, Upper Boat (S. Wales Power Co.), and Lydney (West Gloucestershire Power Co.).

The Electricity Commissioners now propose that seven of the "temporary arrangement" stations shall be made selected stations, *viz.*, Bath, Exeter, Llanelly (Llanelly & District Co.), Moredon (Swindon Corporation), Newton Abbot (Torquay Corporation), Plymouth and Portsmouth.

They have accordingly prepared a new scheme entitled "The South-West England and South Wales Electricity (Alteration and Extension) Scheme, 1934," which gives effect to this alteration and extension of the original scheme, and provides for the consequential transference of certain transmission lines and sub-stations from the category of secondary main transmission lines, in which they were placed in the original scheme, to that of principal main transmission lines required for interconnecting selected stations with one another and with the systems of authorised undertakers and of the Central Electricity Board.

The Dairy Show

Electric vehicles an important item at the Agricultural Show

EIGHT electric battery propelled vehicles exhibited by four firms simultaneously under one roof is a sight sufficiently uncommon to arouse comment. It is to be hoped that this was no mere sporadic effort, but a notable sign of the times.

The fifty-sixth annual Dairy Show, which is being held this week at the Royal Agricultural Hall, Islington, is a particularly appropriate occasion on which to draw attention to the special suitability of this means of transport for the house-to-house delivery of foodstuffs in general and dairy produce in particular.

In addition to a standard four-wheel 10/12-cwt. van, Electricars, Ltd., are showing an 8-cwt. chassis designed for ease of control by foot pedal alone, repeated depression of which provides a steadily increasing speed. A main switch is fitted, together with a small forward and reverse lever which can be removed when in the neutral position to prevent unauthorised starting of the vehicle.

A metal-clad battery charging outfit and three 10/15-cwt. vans arranged for the carriage of crates of milk bottles are on the stand of P. W. Taylor. These are of the Gordon-"Metrovick" design with three wheels, the motor being mounted on the single front wheel.

Thirty-five body styles are offered by A. E. Morrison & Sons, Ltd. Besides a 10/12-cwt. van, a 7-cwt. "Trilec" is shown which is suitable for a bottled milk round of thirty five gallons. It is of the three-wheel type, the driver sitting over the single rear wheel, which is chain-driven by a motor amidships. The back wheel is easily detachable in the usual way without affecting the chain.

The new International-B.T.H. "Liftop" refrigerator

One covered 10-cwt. van is shown by Nelco, Ltd., with inside runners on which the crates of milk bottles are stacked in tiers. The floor of the body is removable for cleaning and to provide access to the batteries and chassis. Illustrations of the vehicles mentioned appear on page 579.

Apart from standard cabinets, Frigidaire, Ltd., has a milk cooler for dairies which starts and stops automatically according to the flow of milk. There is also a water cabinet surrounded by refrigerating tubes for cooling milk by the immersion of the churns in the water.

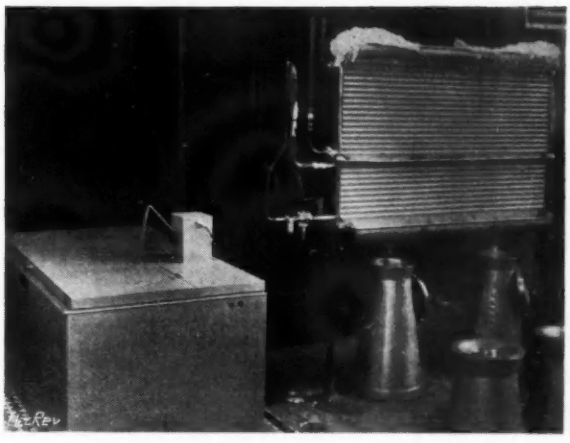
In addition to ice-cream chests, cabinets, and cold-room equipment, a new item shown by the International Refrigerator Co., Ltd., is the all-steel "Liftop" cabinet. The storage space is accessible through a hinged lid at the top, instead of the usual front door. The refrigerating unit is underneath, being of the hermetically sealed B.T.H. make and guaranteed for four years. This model consumes less than 1 kWh in twenty-four hours, and stores food for four persons for two days, its price being £29 10s.

A motor-driven water pump by Beatty Bros., Ltd., is made to start and stop automatically under control of the pressure within the closed water tank. A special valve is incorporated which periodically allows air to be pumped into the tank with the water, so obviating air admittance by hand.

The Wolseley Sheep Shearing Machine Co.'s method is to use a small motor driving through a long flexible shaft. Similar horse clippers are made and also a cream separator driven by a built-in motor.

The International-B.T.H. stand with cold-room outfits in foreground

Gascoignes (Reading), Ltd., make equipment that is driven by a single motor for milking, feeding, rationing, timing, inspecting, weighing, and conveying the milk to the dairy. The Alfa-Laval Co., Ltd., also shows automatic milking equipment, as well as a portable milking machine of the motor pulsator type for small herds; also a magnetic milker and cream separators with built-in motors or for belt driving.



"Frigidaire" automatic milk cooler and churn-immersion cabinet

Such equipment as milk coolers, bottle washers, carton and bottle fillers and cappers, cream separators, and sterilising outfits are shown in profusion, usually belt or chain driven by a motor, models with built-in motors being in the minority. Suppliers include Aveling-Barford, Ltd., who also make an electric cream scalder; Boucher-Giles & Co., Ltd.; the British Miller Hydro Co., Ltd.; George S. Clayton, Ltd.; Cockx & Sons; the Creamery Package Manufacturing Co., Ltd.; the Dairy Outfit Co., Ltd.; the Dairy Supply Co., Ltd.; A. Grabham & Co., Ltd.; Graham-Enock Manufacturing Co., Ltd.; Melotte Separator Sales Co. (1931), Ltd.; Perfect Dairy Machines (England), Ltd.; and the U.D. Engineering Co., Ltd.

Poultry appliances include the Bingham mechanical plucking machine, which is motor driven, and incubators heated, ventilated and controlled electrically, as well as hovers and brooders as supplied by Jos. Bannet & Sons, A. H. J. Bull, Ltd., Curfew (also water heaters and egg-testing lamps), Harvey Martin, Petersime, and Revill & Grigg egg graders, which may be motor driven.

The Change-circuit System

THE change-circuit (or variable-voltage system) was introduced to the electricity supply industry a few years ago and its technical features were described in the Electrical Review in several articles. Two of these articles by Mr. G. Wilkinson, the inventor, appeared in our issues of June 17th, 1927, and March 15th, 1929. Equipment was demonstrated at the Stafford works of the English Electric Co., but the invention proved to be somewhat before its time because its efficacy depends on the use of appliances working on the thermal storage principle (which depends on watts not volts) and these were then in an early stage of development.

The rapid headway now being made in the adoption of thermal storage for water-heating, space heating and even cooking, opens up a new field for the change-circuit system. The system is simple; its chief features are an ordinary induction regulator and an additional cable core for each distributing circuit to carry the variable voltage supply to the thermal storage apparatus, the energy supplied to which is at a minimum when the constant-voltage load is at a maximum and *vice versa*, making possible load factors approaching 100 per cent., and reducing voltage fluctuations.

For blocks of residential flats and new building estates the cost of the extra conductor and the induction regulator with automatic control and switchgear is, according to a newly issued publication of the Change Circuit Development Co., 82, Victoria Street, S.W.1, more than offset by the reduction in kW charges and distribution standing charges due to the lower maximum demand. It is suggested also that part of the cost of the additional copper could be legitimately debited to the constant-voltage supply since this is relieved of a portion of its load. Apart from the clear way it sets out the case for the change-circuit system, the publication is worth obtaining for the statistics given of consumptions and costs of supplying under various conditions.

Electricity in Mines

THE report of the Electrical Inspector of Mines (Mr. J. A. B. Horsley) for 1933 shows that the amount of coal raised from 2,126 pits was 211.8 million tons compared with 213.4 from 2,158 pits in 1932.

Electricity was in use at 1,336 of these—a reduction of twenty-three. Nevertheless, the h.p. of motors installed above ground increased by 19,000 to 904,000 and below ground by 14,000 to 984,000. The total increase over the year 1929 was 135,000 h.p., although the number of electrified mines then working was 120 more.

About 43,200 motors were installed (20,300 above ground and 22,900 below) compared with 41,800 in 1932 and 37,800 in 1929. The proportion of a.c. motors to the whole is 82.3 per cent., and the capacity of d.c. machines has declined by about 8,000 h.p. during the past five years.

In 1933 sixteen accidents involved the loss of twenty-one lives, fifteen by electric shock and six due to one explosion of firedamp; with one exception these accidents took place below ground. This is the largest number of fatal accidents in recent years, but the increase is believed to be fortuitous; there was a more than corresponding decrease in non-fatal accidents (which numbered forty-one, causing injury to fifty persons), making the total of notifiable accidents fifty-seven compared with sixty-four in 1932 and sixty-nine in 1928.

The explosion at West Cannock colliery was due to sparking in a signal-bell circuit that was not of a certified type. A fatal shock was received at 58 V, and in another case it was not until after a post-mortem examination that electricity was suspected as the cause of death.

There were two instances in which fatal shocks were received from casings that were earthed in accordance with statutory requirements. Owing to the possibility of a considerable difference of potential between the extremities of the earth wire, earthing by itself is shown to be an incomplete safeguard against a dangerous shock, although it is a necessary condition for bringing about the automatic isolation of a faulty circuit. Leakage protection is recommended and two appendices are devoted to the various aspects of this method.

It is pointed out that the insertion of a resistance of 5 ohms between the neutral point and the earth connection would, with leakage protection operative for a fault current of 50 A, reduce the potential drop in the earthing conductor to a safe value. A current-limiting resistance is unobjectionable only if it restricts fault current to a lower value than that required to operate the automatic cut-outs. Leakage protection reduces the risk of fire and open sparking as well as of shock, but there is no general agreement regarding the appropriate sensitivity or the location of leakage trips. There is not much more danger in a wet place than in a dry, but foot-to-foot shocks due to potential gradient in surface soil are common.

Contributory causes of fatal accidents are divided into five groups: (a) design or unsuitability, 2; (b) installation or maintenance, 20; (c) misuse, neglect or ignorance, 5; (d) organisation, lack of equipment, 1; (e) unforeseeable, 4. The respective totals for the past ten years were 31, 20, 18, 16, 18; coal cutter men were the greatest sufferers with 28 per cent., while electricians formed 23 per cent of those killed.

In the non-fatal category over the ten years out of 488 accidents 428 were due to electric shock and burns. Defects in design or misapplication were responsible for 75 of these, maintenance for 120, and misuse or negligence 232.

While switchgear and fuses were involved in 26.7 per cent. of the eighty-six fatal accidents and 45.5 per cent. of the 488 non-fatal cases, trailing cables and plug connectors were involved in 46 per cent. of the deaths and 37 per cent. of the injuries. Nearly all these were associated with coal-cutting machines.

For conveyors and loaders, the choice of cable lies between a three-core pliable armoured cable, with permanent or quasi-permanent couplings, or a five-core screened flexible cable with a free plug and electrical interlocking; several diagrams of connections are given in an appendix. Automatic circuit-breakers are steadily superseding fuses for the control of such circuits.

In connection with the death of a user of a defective portable lead for a 230-V hand lamp while cleaning a boiler, it is recommended that a battery lamp should be used for such work. The 241 additional electric coal-cutting machines (2,300 h.p.) installed in 1933 (making the total 4,211) dealt with 6¼ million tons out of a total increase of 7¼ million tons of machine-cut mineral. There was an increase of 416 in the number of conveyors and loaders (3,800 h.p.), and of 5¾ million tons of coal conveyed by electricity, out of a total of 9¼ million tons conveyed by electricity and compressed air together. Other additions below ground during the year were 7,000 h.p., equally divided between haulage and pumping. Above ground, 9,000 h.p. of motors was installed for cleaning and screening, and 7,000 h.p. for winding.

Certificates for flameproof enclosures tested at the Mines Department's station at Buxton were issued for 111 pieces of apparatus, of which air-break switchgear (27) and induction motor (20) constituted the largest individual items. Particulars of these are given in an appendix. Quarterly summaries of subsequent certifications have appeared in the ELECTRICAL REVIEW. Some of the appliances tested were intended for use in inflammable atmospheres in other industries.

Experiments have also been carried out to ascertain the limiting clearances for shaft glands that would not pass flame and for opposed surfaces of metal and insulating material such as in plug and socket coupling devices.

Electricity Supply Around London

THE report of the London and Home Counties Joint Electricity Authority for the year ended March 31st, 1934, shows that the capital expenditure at that date was £3,413,000, of which £2,077,000 had been spent on the acquisition of undertakings and £1,267,000 on their extension.

Mr. F. W. Purse, the chief engineer of the London J.E.A.

Members of the Authority are elected by municipal and company authorities and others. The constituent undertakings with the largest sales within the area were the North Metropolitan Co. (324 million kWh) and the Metropolitan Co. (223 million). Others selling over 100 million kWh were St. Marylebone and Croydon Corporations.

The Authority distributes electricity in six areas acquired in previous years from their former owners, *viz.*, Surbiton, Twickenham, Sutton, Dorking, Leatherhead, and Weybridge. Tariffs have been standardised and particulars have appeared already in these columns; the domestic rate is based upon the size of house with a running charge of ½d. per kWh in the summer and ¾d. per kWh in the winter, with an addition of ¼d. for supplies in the outer zone. During the past year showroom extensions have been made, and a travelling showroom has been provided.

Voltages have been standardised at 440/230 in the outer area of Dorking (from 240 V d.c.) and in Sutton (from 400/200 V a.c.). Agreements were made with several local authorities with regard to public lighting, bringing the total to ten, involving the conversion of 7,518 gas lamps.

The kWh supplied to feeders amounted to 66 million (an increase of 29.8 per cent. on 1932-33) with a m.d. of 26,670 kW for a connected load of 139,600 kW (51.4 per cent. increase) and 75,700 consumers (26.6 per cent. increase). Of these consumers 28,500 were on the two-part tariff and 9,830 on the assisted-wiring scheme.. When the J.E.A. acquired these undertakings at the end of 1930 the total number of consumers was 37,000. Apparatus on hire comprised altogether 5,157 cookers, 470 wash-boilers, 415 water heaters, 1,009 irons, and 3,404 kettles—in every case a very substantial advance on the previous year's figures.

About 300 miles of mains were laid in the twelve months. In the rural areas south of Dorking, which are served by overhead lines, 949 consumers are now connected, of which 389 are of the assisted-wiring class. Applications have been received for 298 cookers, 14 water heaters, eight wash-boilers, and 48 h.p. of motors. Cookers connected total 249. A combined domestic tariff has been introduced with an inclusive kWh charge to cover all uses and rent of cooker and wiring.

The J.E.A. operates the generating stations of eighteen undertakings with an aggregate output of 243 million kWh and a m.d. of 114,000 kW, supplying the electricity required by the owners. It also takes energy from the Central Electricity Board for its own distribution areas.

A sum of £625,000 was expended during 1933 in capital extensions of the distributing undertakings and the gross revenue surplus was £198,000. After meeting interest and sinking fund charges, the accumulated net deficit at the end of last March was £25,000, but the lag in revenue due to the introduction of a continuous meter-reading system was estimated by the Authority at £55,000.

MEETINGS AND DISCUSSIONS

Current Topics and Opinions Expressed at the Institutions

Co-operation with the User

IN his address as chairman of the South Midland Centre of the INSTITUTION OF ELECTRICAL ENGINEERS at Birmingham on October 17th, Mr. W. Burton said there was no doubt that to quote platitudes was easy, but it was necessary at times to repeat them in order to attract notice. Just as showmen had realised that reiteration claimed a hearing, so must engineers remind themselves of the need for real co-operation in order to increase their usefulness.

The speaker went on to point out that too commonly the only contact was between the manufacturer's salesman and the user's buyer. Frequently an original idea was passed to the Development Department, which tested the proposal, and then the Production Department evolved a design incorporating the principles aimed at. In the main the prospective user, who might be expected to know most about the application of the device, was not consulted.

Mr. Burton said that that was quite wrong, and he suggested that proper co-operation would help both parties. For instance, the British Standards Institution publications were records of agreements between manufacturers' representatives. But as they purported to represent users' requirements also, the views of the users should be canvassed. The proportion of the few users on the committees was so very small that it was not easy to get their opinion accepted against that of the manufacturers. As a result, many users could not specify the standards without qualification or addition; this reduced the value of publications which had required the expenditure of much time and thought.

Although it was not feasible to give representation to all users, and notwithstanding the fate of many questionnaires, it would pay to obtain the views of the users particularly concerned in each case.

Will Demand Exceed Supply?

The returns of authorised undertakers were a promising record of progress. A yearly increase of output between 10 per cent. and 20 per cent. was satisfactory, not only to the supply engineers, but also to makers of all classes of apparatus. Power was needed in production and again for operation. This called in time for larger service facilities and many schemes for the installation of new boilers, turbines, and generators were now moving forward, but even now it seemed probable that the demand would be in excess of the supply available. During a recent cold winter period there were many instances of demand over ten times the normal. Since that time many heaters and cookers had been installed, and the next cold period might find a shortage of plant unless large extensions were made to most stations. When the heating demand was great, more care would have to be used in deciding the diversity factor.

Importance of Load Factor

The importance of load factor was not confined to electricity supply, but affected all classes of business. Schemes evolved to improve it, in most cases, had consisted of special offers to consumers to take off-peak supplies. This introduced the difficulty that valleys in the load curve might become peaks. Instead of troubling unduly about the present peaks, efforts should be made to obtain new load having nearly 100 per cent. load factor, so that in a very few years the load curve would have such large ordinates that the present peaks would be scarcely noticeable in proportion.

It could be shown quite readily that straightforward additions of 100 per cent. load factor supplies considerably improved the overall load factor, and if the additions of plant were maintained—and there was every reason to suppose that they would be maintained—the load factor would be improved automatically.

Water heating loads were to be recommended, particularly for domestic use in rural areas, where the maintenance of a high-load factor made the fullest use of all the plant right back to the power station.

Coal Cleaning by Gravity Methods

THE paper by Mr. A. A. Hirst, which was read before the INSTITUTE OF FUEL in London on October 17th indicates the character of the work that is being done in the Coal Treatment Research Laboratory at Birmingham University. The author shows how the problem has been attacked by new methods and gives an account of various practical developments.

Probably, for beds of particles which are more or less interlocking, the best approximation to a "density" separation is obtained when the bed is just disrupting under the influence of an upward current. This condition is unstable with respect to a continuous current, but may be profitably employed with a pulsating one. The closer the sizing of an interlocking bed the more stable is its arrangement to the reshuffling produced by the stratification of heavy particles and, in practice, the less is the need for suction to *maintain* interlocking conditions. In practice a bed cannot be rendered *perfectly* fluid by the passage of an upward current; there will always be "residual" frictional forces. These forces may necessitate close sizing when delicate separations are required. Results are given of experiments showing the separation effected by sand-flotation.

The usual arrangement of the raw coal bunker in series with a washer box may be responsible for some degradation. This degradation can be avoided by putting the bunker in parallel, but the washer then has to handle considerable variations in the rate of feed. A self-regulating Baum washer box is described in which the strength of the pulsations is regulated automatically to suit variations in the grading and quantity of the feed. In pneumatic or wet jigging, when only weak pulsations are required, the dirt bed may not be rendered sufficiently fluid to travel towards its discharge point. A modified design, overcoming this difficulty, is described. Some further information is given concerning recent applications to washer boxes of patent stirrers and submerged floats.

Instrument Design and Manufacture

THE necessity for specialist design and expert workmanship in the production of measuring instruments and protective relay equipment was emphasised by Mr. G. A. Cheetham in his address as chairman of the North-Western Centre of the INSTITUTION OF ELECTRICAL ENGINEERS at Manchester on October 23rd.

For instance, the stress on the pivot of an electricity meter is of the order of 50 to 100 tons per sq. in., a value which would cause machine designers to have sleepless nights. As an example of the improvement achieved in production methods it was stated that a 10-A single-phase meter was sold to-day for less than half the price quoted in 1914.

Instrument and relay design had been affected considerably by the discovery of new materials, and the copper-oxide rectifier, the photo-electric cell, and the thermionic valve had also advanced the field of commercial measurement considerably. Two special materials for permanent magnets, which were claimed to give a much greater maximum B.H. value than the alloy steels at present in use, were a nickel-iron-aluminium alloy and a nickel-cobalt-titanium-steel alloy. The use of strong light alloys had considerably strengthened the moving parts of instruments, without increasing their weight.

The introduction of synthetic resin had also assisted in the improvement of the mechanical construction, since it had enabled a designer to combine into one structure a large number of otherwise separate parts; also it was a good insulator. Cobalt steel had rendered possible a greater stability of permanent magnets, which was extremely important, as a variation of 1 per cent. in the flux might produce an error of 2 per cent. in registration.

Great care was necessary in the use of rectifiers in connection with moving-coil instruments. There was a possibility of serious errors in a.c. circuits with distorted wave forms, and in some cases liability to excessive temperature errors, but for sinusoidal circuits and with correctly designed combinations a very satisfactory universal instrument could be made. The photo-electric cell had completely revolutionised photometry and made the measurement of the actinic properties of light an exact procedure, independent of the human factor.

Thermionic valves were being advocated for use as relays in protective schemes. They possessed advantages in some applications over mechanically operated relays, but had the disadvantage of a comparatively short filament life. They had consequently to be duplicated or triplicated, and a comparatively complicated scheme had to be devised for the cutting in of a new relay in the event of a filament failure.

Moving coil instruments of the original D'Arsonval type were still prevalent, and the miniature type had become very popular during the last few years. Induction instruments had survived because of their long scale, high torque, and robust nature; they could now be supplied as Grade 1 instruments and were very much favoured for switchboard use. The elec-

trostatic type of voltmeter had been revived, and robust switchboard and portable types were available for voltage ranges of 0 to 150 up to 0 to 3,500 V. The improvement of the single-phase a.c. meter had been considerable, but it had not changed in fundamental design since its original invention, though the improvements in performance over the last few years had been remarkable.

Considerable advances had been made in the last few years in the design of prepayment meters. The necessity for attractive tariffs had brought about special designs of multi-tariff prepayment meters, and much ingenuity had been expended on the starting devices and on mechanisms whereby the tariff was changed after a lapse of time, or after the collection of a given number of coins.

Protective Gear

The Merz-Price system of protection fulfilled, theoretically, the most exacting requirements, and where cost was unimportant nothing was known that was an improvement on this method. Only commercial reasons had limited its application and most of the modern development of protective gear had been to devise satisfactory schemes which did not require pilot wires.

Both the impedance and reactance methods of protection departed entirely from the Merz-Price principle. One method which was closely related to the Merz-Price was to carry pilot carrier currents along the lines themselves. They were injected into and taken out of the line through capacity paths, the principal weaknesses being that thermionic valves had to be employed in the generation, distribution, and amplification of the carrier currents; the difficulty of preventing radiation from one circuit to another; and of discriminating between the various pilot currents by the use of varying wave-lengths, rejector circuits, &c.

Medium and small sized vacuum circuit-breakers had already been built. Relays had been designed with the whole mechanism *in vacuo* and operated by electro-magnetic means through the envelope, or by the expansion of a hot wire. These relays were capable of dealing with up to about 30 A at 1,000 V quite successfully. They occupied very small space, and were less expensive than electro-magnetic relays. Being hermetically sealed, they were free from troubles due to dust and to atmospheric conditions. The hot-wire types were also perfectly silent in operation. One type had a bimetallic strip, with or without heating coil, also enclosed in the tube and operating directly on the contacts. They could be used for thermostatic control of liquids, &c., by immersing the complete relay.

Time and Load Control

Supply authorities had assumed the responsibility for controlling their frequency sufficiently accurately for time-keeping purposes. The greater the number of stations interconnected, the greater would be the difficulty, and it might be necessary to take over automatically the control of frequency and load.

A scheme had already been devised to carry out this function which briefly operated as follows. In each of the interconnected generating stations was fitted a master time clock. Connected to the bus-bars was a synchronous motor driving a contact device, arranged to compare the timekeeping of a synchronous motor with the master clock every few seconds. If during the period of comparison the frequency increased in advance of the master clock, the servo motors on the turbo-generators would be operated to reduce the steam supply by a small amount periodically repeated. The amount the governor was altered each period would be proportional to the deviation of the electrical time from standard time. To each generator was connected a load relay capable of being set to any proportion of full load at which it was desired it should operate to schedule.

Considering the case in which the electrical time is found to be gaining on the standard time, the reduction of the steam supply reduced the load on each generator. When on any individual generator the load had been reduced below the schedule setting to an agreed tolerance, then lowering impulses to the governor servo-motor would be cut off.

The final result in the station was that the total steam supply was reduced, until at the limit, the load on each generator was reduced below the schedule by a given tolerance. After this had happened the frequency-control device would cease to function. If this action occurred simultaneously in all the important stations, the result would be to correct the frequency.

While the electrical engineer, individually, was seeking for the maximum of result with the minimum of expenditure in the design of his apparatus, the instrument making industry as a whole fell very far short of this ideal. Much closer co-operation inside the industry would result in the agreed division of special development between the members of the industry and much expense would be saved.

* * *

Coal and Electricity

Mr. Frank Hodges addressed members of the Mining Institute of Scotland at Glasgow on October 17th on the prospects of the coal industry. After a reference to the inroads made by oil, he spoke of electricity as an industry with a phenomenal rate of progress. The use of coal in the electricity supply industry, he said, had grown immensely, and if it absorbed as much as it displaced they could have no grievance against it. Since 1913 the annual coal consumption of the electricity supply industry had risen from 4.9 million tons to 9.8 million tons. Referring to railway electrification he said it would not affect the consumption of coal as was proved by the Southern Railway's experience. The amount of coal that had been displaced by the abolition of the steam engine coincided exactly with the amount of coal used in the power station, because of the additional mileage run on the electrical system and the increased traffic density. Coal had not suffered in any degree from that development.

Flameproof Mining Gear

THE schedule of certificates of flameproof enclosure of electrical apparatus issued by the Mines Department during the three months ended Sept. 30th, includes the following:—

Anderson, Boyes & Co., Ltd.—100-A B.S. plug and socket, modified to take individual insulators for plug terminals.

British Jeffrey-Diamond, Ltd.—Coal cutter motors, 30 h.p. d.c. and 50 h.p. three phase, substitution of cylindrical for chain winding; air break circuit-breaker, 100 A d.c.

British Thomson-Houston Co., Ltd.—Petrol pump motor, 0.5 h.p. a.c., variation; starting and reversing switches; transformer tanks; alteration to skids and type of welds; 125-A oil-immersed circuit-breakers, alternative interiors; distribution box; conveyor motors, alternative attachments.

Climax Rock Drill & Engineering Works, Ltd.—Coal drill, 0.98 h.p. three phase, with hand-grip switch and remote control 25-V pilot circuit.

Charles Crofton & Co. (Engineers), Ltd.—100-A B.S. plug and socket, modification for supplementary pilot cable.

Electrical Apparatus Co., Ltd.—Control panel, modification; 150-A d.c. and a.c. air-break gate-end switches, alternative designs.

General Electric Co., Ltd.—500-A slip-ring enclosure.

Horace Green & Co., Ltd.—Squirrel-cage motor, 30 h.p. three phase, variation in output and core length.

Harland Engineering Co., Ltd.—Squirrel-cage motor, 70 h.p. three phase.

Heyes & Co., Ltd.—Prismatic fittings for 60- and 100-W lamps with integral terminal box and additional sealing chamber.

Austin Hopkinson.—Plugs and sockets, 60 and 100 A, also reversing; coalcutter, 50 h.p. three-phase squirrel-cage.

Laurence, Scott & Electromotors, Ltd.—Slip ring induction motor, 75 h.p. three-phase "Emcol" type; and 2-h.p. squirrel-cage motor combined with external ventilating fan.

M. & C. Switchgear, Ltd.—Remote control gate end box, 100 A with alternative attachments; bell pull for intermittent signalling, 25 V a.c. or d.c.

Macintosh Cable Co., Ltd.—Cable coupling box, two- and three-pin compound filled; also junction and interconnecting boxes and coupling box adaptors.

Mather & Platt, Ltd.—Squirrel-cage motor, 7 h.p. three phase; also variation of rating and substitution of wound rotors with slip-ring enclosures.

Metropolitan-Vickers Electrical Co., Ltd.—Slip-ring motor, revised terminal arrangements; terminal box, alternative attachments; air-break drill unit with frequency changer, 50/150 cycles 650/125 V; oil circuit-breaker, 150 A three phase, revised attachments; conveyor motors, alternative attachments.

Morley Electrical Engineering Co., Ltd.—Squirrel-cage motors, 3 to 10 h.p.; similar conveyor motors combined with alternative starters.

A. Reyrolle & Co., Ltd.—Coal face fitting for 30-W 25-V lamp; air-break gate-end control unit, optional arrangements; gate-end transformer unit; transformers for roadway and coal face lighting; air-break circuit-breaker, 30 A three pole, alteration.

Simplex Electric Co., Ltd.—Air-break switch, d.p. 5/15 A for wiring in conduit.

Uskside Engineering Co., Ltd.—Air-break direct line starting switch, 3/36 h.p. three phase.

Veritys, Ltd.—Well-glass fitting for 40/60-W lamps and junction boxes.

Walsall Conduits, Ltd.—Air-break switch boxes, 5/15-A four-way for conduit installations only.

Correspondence

Correspondents should forward their communications as early as possible. No letter can be published unless we have the writer's name and address in our possession

Large Power Supplies

In your leading article of October 12th, you state that you believe that Messrs. Thomas Firth & John Brown, Ltd., are the largest individual users of electricity in this country taking a supply from the public mains. I would, however, draw your attention to the fact that the Lochaber Power Co. supplied the North British Aluminium Co. with 139 million kWh in 1931 and 167 million kWh in 1932.

Year Ended Dec. 31st.	kWh. Sold by Authorised Undertakers.	Percentage Increase on Preceding Year.	Sold per Head of Population.
	(Millions.)		
1922	3,645	—	86
1923	4,339	19.0	100
1924	4,998	15.0	117
1925	5,515	10.4	125
1926	5,723	3.8	130
1927	6,850	19.6	155
1928	7,603	11.0	171
1929	8,596	13.0	193
1930	9,029	5.0	202
1931	9,386	3.9	210
1932	10,096	7.5	224

In a leaderette in the same issue you state that such figures as these tend to alter the percentages and averages for the country as a whole. In support of this view, I would remind you that during the third reading of the 1926 Electricity Bill it was mentioned that if the supply to the Electrolytic Zinc Co. by the Tasmanian Hydro-electric Department were deducted, the average consumption per head would drop from 550 to 130. If the kWh taken by the Aluminium Co. is deducted from the total consumption for motive power in the whole of Great Britain, the latter would be about 2.6 per cent. less in 1930-31 and over 3 per cent. less in 1931-32; while the average price per kWh charged for motive power would be 0.83d. in the first case, instead of 0.81d. given in Engineering and Financial Statistics and 0.82d. in the second instead of 0.79d. In any case the figure is far too high.

During the three years subsequent to 1929, the average increase has been only 5.8 per cent. per annum. We shall need to have many such large consumers as that connected in Sheffield last week if we are to reach the goal of 500 kWh sold per head by 1941, which was the figure anticipated when the Commissioners' schemes for the grid were worked out. The table above provides a corrective to too facile optimism.

October 13th. ELECTRIC POWER.

Domestic Installations

In reply to the letter by "H. A. B." in your issue of October 12th, I am sorry to see that he finds all-electric running to be uneconomical. His figures appear to me to be very high for the type of house detailed for three people. In my case there were two.

My figures, although given for last year, have varied very little over a period of five years, so that the figures are of more value on that account. It is true that often there is no fire on from breakfast until late afternoon, except at weekends; this is quite normal, as in most households of two there are times in the day when no one is at home on several days a week.

The only other point that I can see to account for the big difference in figures is in the type of fire used. Mine are radiant heat, parabolic reflector type. This means that the usual consumption is about 1,200 W instead of the 2 or 3 kW found necessary with the usual convector fire. When it is very cold the load is double the above. Many firms now make these fires so that I am not boosting any one make.

Manchester, *October 20th.* E. H. W. BANNER.

Services for Cottages

You have from time to time drawn attention to unobtrusive methods of supplying electricity to small residential property. My Council, the Mynyddislwyn U.D.C., completed an extension scheme to Oakdale twelve months ago. This is a colliery village situated on a hill and it is spoken of as one of the finest model villages in the country.

For economic reasons low-voltage mains were erected almost entirely overhead, and a desire was expressed by the Tredegar Iron & Coal Co. (which owns most of the properties) that the method of running the services should not be ugly. As many complimentary remarks have been passed on the neat manner in which the services have been carried out I am submitting notes of the scheme which may interest other engineers.

The colliery company requested that as far as practicable the whole of the services should be carried out at the rear of the premises. Before the work was commenced I spent considerable time in designing a scheme to meet with their approval. The architectural design of 40 per cent. of the houses did not lend itself to services either at the rear or the front of the houses. I therefore decided to carry the mains through the attics with v.i.r. drawn into 1-in. conduit using ¾-in. conduit for the branch mains to the meter board. Catenary wires run between blocks of houses are unsightly and were therefore dispensed with, the phase wire being bound to the neutral.

To avoid trespass on consumers' gardens and disfiguring the outside walls, cut-out boxes were bolted direct to the poles and all the phase wires ("Maconite" and "Helenite" insulated cables) were bound direct to a p.b.j. neutral by black tape and soft copper binders. The other 60 per cent. of the premises were fed by twin-covered insulated cable at the rear. Tapping of current is prevalent in these districts; for this reason I adopted in 1929 a system of running all single lead cables into consumers' premises, a procedure which was adopted on this scheme. As a further precaution Henley insulated single-pole cut-outs were used throughout. The single lead cables were brought in behind the meter board and fixed to the terminals; thus no part of the cable was visible on the meter board. C.M.A. cables have been used throughout the scheme.

The scheme was commenced in April, 1933, and completed in six months. Eight hundred and fifty houses were serviced and wired internally under an assisted-wiring scheme carried out by direct labour under my supervision. The interior wiring was carried out with c.t.s. cable and, anticipating the new regulations, an earth wire was run in conjunction with the interior wiring. From the outgoing side of the service cut-outs lead-covered cable is carried to the meter terminal and an extended meter-cover terminal has been fixed. The meter was then earthed and the lead cable bonded direct to the meter. The only method by which current can now be tapped is by breaking the seal; any other method of interference would automatically blow the fuse. D. J. WILLIAMS, A.M.I.E.E.,

Pontllanfraith, Mon., *Oct. 19th.* *Engineer and Manager.*

Selling Electrical Goods

I have read the leaderette bearing this title in last Friday's issue relating to the regrettable state of the electrical trade, which too often forces good workers during a bad period of unemployment to accept a "door-to-door" position on commission basis. Possibly, some exception may be taken to my use of the term "regrettable," but it is unfortunately justified, partly owing to the fact that certain electrical firms, under a false idea of "economy," are in favour of juvenile labour, often displacing older and more experienced men, possibly.

A counter salesman, or possibly an experienced storekeeper, given a good appearance and personality, might very well be adaptable enough to make a fair outside representative, but it is extremely doubtful if any wholesaler would offer him a standing wage. Accordingly, the unfortunate man is forced to become a cheap advertising medium for some bright enterprising concern, ready to reap the advantage, under a "payment by results" system, to the detriment of the bona-fide "commercial," who already finds business difficult to get under the best conditions. VICTIM.

October 20th.

The I.E.E. Regulations

Now that there has been time to reflect upon the new edition of the I.E.E. Regulations and their implication in certain cases, it appears that some modifications or amendments will be necessary and an exchange of views among your readers will, I suggest, prove very interesting.

Shortly before publication of the present Regulations I had collaborated with the engineers of a very progressive electricity supply authority in producing a leakage-current actuated switch which fully met the operating conditions for which it was designed. Upon publication of the new Regulations it was discovered that either Rules Nos. 1005 C. and 1332 B. would have to be ignored, or the efficiency of the apparatus sacrificed if it were reconstructed to comply. Briefly, this apparatus consisted of a 50-A single-pole switch fitted with a wax thermal trip connected between a conduit system and earth. The trip was operated with a load of one ampere, the resistance being 1.4 ohms so only a very small potential rise between conduit and earth (2 V) was required to interrupt the supply. Incidentally on test the wax thermal trip element was subjected to full line voltage (230 V) and was undamaged after actuating the 50-A switch.

The 50-A switch employed in the experimental model was removed from a well-known make of prepayment meter of which there are thousands in use. The switch was of the a.c. short-break type and on test successfully interrupted a load of 200 A at 400 V, although the contact break is only .01 in.

Now Regulation 1332 B requires every switch to be tested with d.c.; up to 30-A rating the test is rating plus 30 per cent., and above 30-A rating plus 50 per cent. Quite obviously the a.c. short-break switch would not clear 2 A at 400 V d.c., so if Regulation 1332 is to be enforced then a great amount of highly efficient a.c. switchgear will have to be scrapped—not only prepayment meter switches but also thermostatically controlled switches so largely employed with water heating.

Regulation 1005 requires load-carrying switches to be actuated should a current not exceeding 30 mA pass *via* the trip circuit from a conduit system to earth. Now there are many considerations to be taken into account when dealing with leakage-current apparatus and its design. Regulation 1005 applies only to a limited number of cases.

Any trip mechanism requires some energy to cause its actuation; assuming this to be 1.5 W (usual with the smaller switches), the prescribed 30 mA when corresponding to 1.5 W entails a 50-V rise in potential between conduit and earth before sufficient energy is available to trip the switch. It also follows that less than 50 V will not trip such a switch so that it is possible to have a conduit system constantly at, say, 40 V potential above earth and the device will sometimes trip and sometimes will not, but the leakage remains for ever. In the instance given concerning the low resistance wax thermal trip Regulation 1005 could be met by employing a small current transformer, the primary winding being connected between conduit and earth and the secondary winding to the wax trip. This meets the condition that 30 mA must trip the switch, but it also means that the conduit system must reach an unnecessarily high voltage before the supply can be interrupted.

While considering the effect of certain Regulations No. 715 B might be mentioned, dealing with the connection of a neutral of a three-phase four-wire system to the shell of an electrode boiler. The Commissioners' Electricity Supply Regulations prevent a neutral from being connected to earth at more than one point (unless special permission is first obtained). In a rural area having no water main for earthing, a neutral has great possibilities if a leakage trip circuit could be connected from neutral to conduit system, using suitable resistances. Certainly the neutral would be earthed through a high resistance, but efficient protection would be obtained against high voltage rise on a conduit system.

Regulation 715 permits a neutral to be connected to the shell of a boiler wherever it is situated and if the neutral is connected to an unbalanced three-phase system and therefore carries a load, the fact that it is earthed at two points means that the earth and underground water or other pipes become a parallel path for the out-of-balance current carried by the neutral. In a district where water, gas or similar pipes can share this earth circuit there is a strong objection to applying Regulation 715, but in a rural area where no water pipes exist the objection is not present but the Commissioners' Electricity Regulations are against the practice. A. G. BULLEN.

Liverpool, *October 15th.*

Training Control Engineers

Recent incidents on the grid have shown that there is room for an improved method of training control engineers. For weeks the control man's duties may be simple and according to routine, and then suddenly an emergency will arise when he has to use his head in conditions which may never have been contemplated by him. There is no time to use the book of rules; things have to be done quickly and correctly.

It would be an advantage if the control man could be tested once a week on emergency operation so that he would know what to do when the emergency came. This can be achieved by models of the system, which have now been introduced, by which it is possible to find experimentally what will happen on the circuits under various conditions of supply, and it ought not to be difficult to elaborate these so that they will mimic actual conditions when things go wrong. Current of small amperage can be used to operate instruments which will mimic what may happen when short-circuits and various kinds of faults develop.

If a lecture room was fitted up with such a model installation, the control men could hear lectures, say, once a week and could then be introduced to the control board, when the lecturer would produce on the instruments the disturbances which would arise with faults. The control men would then be asked to meet them in the most efficient manner possible. With such apparatus the men would have so much experience that they would become familiar with every possible type of fault, and when these arose in actual practice they would feel far more comfortable in dealing with them than they do now when a man may go for a year without ever meeting a serious emergency.

The cost of a model control room would be more than met if it prevented one serious shut-down, and it would also be possible to invent extraordinary faults and thereby to bring about the provision of means of meeting every contingency without having to undergo the nerve-racking strain when such agglomerations of trouble as have occurred recently come along. C. TURNBULL.

Tynemouth, *October 17th.*

Vacuum versus Air Displacement

With reference to the article, "Electric Cleaner Production," on page 436 of your issue of October 5th, we would ask why you deliberately avoid the use of the word "vacuum" when this has played a most important part in the production of electric cleaners. The fact that a machine with a low vacuum reading, *i.e.*, low *suction* reading, can, at the blowing end, upset a cardboard box at a greater distance than a machine with a much higher vacuum reading, is not proof of the efficiency of an electric cleaner. What matters is not the velocity at which air is emitted, but the pressure of the air as it enters the cleaner.

With vacuum and air displacement figures as published by you of 20 in. and 30 cu. ft., respectively, and with a motor consumption figure of 200 W, there is no doubt that the motor used in the cleaner is not sufficiently powerful for its job. In other words, there is an air flow, but not pressure, and it is the pressure which is needed to give efficient suction power.

The standard method of measuring air flow, by the way, is to read a figure on the anemometer with a head of 10 in., and for the other, to have a motor powerful enough, when the air flow is entirely restricted, to create a pressure so strong that dust particles are easily drawn up into the machine.

To put it in somewhat simpler language, we would state that British electric vacuum cleaner manufacturers with many years of experience have, with full knowledge of the facts, concentrated on producing as high a degree of vacuum as possible, which vacuum can only be attained by the correct amount of air flow at the *suction* and not the blowing end. The higher the vacuum the greater will be the *inrush* of air and dust particles to displace it, and we, the undersigned manufacturers of the "Mary Ann" and "Vac-Tric" electric *vacuum* cleaners, dispute the correctness of Mr. Doering's statement.

BRITISH ELECTRIC DOMESTIC APPLIANCES, LTD.,
(*S. F. Sheridan*).
VAC-TRIC, LTD. (*Chas. L. Pegley*).

London, *October 16th.*

The Status of the Consumers' Engineer

The suggestion originally made by Mr. Hickmott in your issue of September 14th that consumers' engineers should be admitted to corporate membership of the I.E.E. on passing an examination in "domestic electricity," seems to the writer somewhat ill-considered. As a chartered professional association the I.E.E. must naturally limit admission to persons possessing the usual qualifications of professional men. I would state these as: A sound general education; a good general knowledge of the profession; special skill in some branch of that profession; and a high standard of conduct and integrity.

Most of the recognised professional bodies attempt to secure these qualifications in their members by means of a general examination, an elementary professional examination of fairly wide scope and more advanced special papers. Although the standard set is perhaps not very high the I.E.E. examination does conform to this general plan.

Mr. Hickmott's suggestion implies waiving the first two requirements mentioned above and thus strikes at the very root of the professional status attaching to I.E.E. membership. I cannot therefore believe that his views will find support except among persons whose admission would be small gain to the Institution. M.AMER.I.E.E.

October 20th.

Precept and Practice

A special cookery demonstration was given at the London School of Electrical Domestic Science, 2, Basil Street, S.W., on October 17th. Mr. Hewson, engineer-in-charge of the Industrial Cooking Department of the Westminster Electric Supply Corporation, was introduced by the principal, Miss Minoprio, and after referring to the recently completed extensions to the school (which include an electric laundry), showed himself as capable as a chef as he was a lecturer by cooking a five-course dinner. The menu was based upon recipes acquired by Mr. Hewson during his practical experience in a large restaurant kitchen. About fifty people were present. Other lectures are to be given at 7.15 p.m. every Wednesday at the same address.

New Apparatus and Devices

for Domestic, Cooking and Heating, Lighting, Power and Scientific Purposes

A Disconnecting Box

The "Standard" fuse or link disconnecting box is a new production of MESSRS. G. P. COSWAY, LTD., Nuneaton. It is built in three parts—the base, the turret and the diving-bell lid, the first two of which are grooved and tongued together on the centre line of the box and bolted. Four fins are cast on the inside of the bell cover for locating the lid on the grease-packed grooved joint provided. Glands can

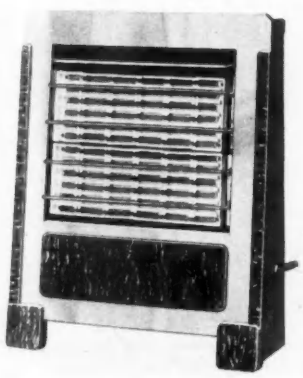
The Cosway disconnecting box

be fitted for any standard cable; the wiping glands are of the drop-in type with heavy c.i. armour clamps.

The assembly rests upon strips of insulating material held in position by steel bolts with bakelite distance pieces. The removal of the posts for sweating the cables (which requires only the withdrawal of a stud pin) does not disturb the assembly. One of the chief features of the design is the elimination of loose parts. The tinned-copper links have double contacts on bolts to which they are irremovably attached, and no joints have to be made under compound. Phases are separated by bakelite, and each box is provided with a link remover and an insulated spanner which fits all nuts within it.

"Hart" Fires

Recent additions to the extensive range of fires produced by the HART FOUNDRY CO., Ryland Street, Birmingham, 16, are 1-kW and 2-kW (18s. 6d. and 29s. 6d.) "Warma" portable fires and 1-kW and 2-kW sizes of the "Bon" panel or inset fire for wall fixing.



The 2-kW Hart "Warma" fire

These all follow closely the construction of the company's more expensive and highly finished models, the front of each being of ornamental cast-iron with a sheet-iron body. They are synthetically enamelled in various colours, while vitreous-enamelled fronts are available if required.

An important feature of the panel fire is the special louvre ventilation system. Cool air enters the frame interior through holes below the elements and flows upwards in two paths in front of and behind a curved polished chromium-plated louvre plate which projects beyond the front of the elements at the top. The air flowing behind the louvre plate is cold, so that it prevents overheating of the wall.

"Eddo" Fires

Two new "Eddo" fires have recently made their début: one is a 2-kW reflector model with a chromium tubular frame, a stainless steel reflector and a "pencil" type element. The switch is at the back of the fire and the price is £2 17s. 6d. A cheaper fire is model 148, fitted with a horizontal former and an ordinary 1-kW spiral element; chromium and black is the standard finish.

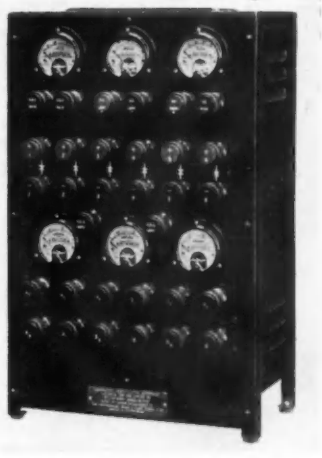
There is also a new car heater with a loading of 200 W costing 7s. 6d. The manufacturers of "Eddo" products are MESSRS. H. G. MOSELEY & CO., LTD., Hospital Street, Birmingham.

A "Fluxite" Gun

A handy tool for storing and applying "Fluxite" has been developed by FLUXITE, LTD., Dragon Works, Bermondsey Street, London, S.E.1. This tool, which costs 1s. 6d., takes the form of a gun, the flux being forced out of the nozzle on to the object to be soldered.

A Rectifier for the Laboratory

A rectifying unit, embodying six rectifiers, three transformers and meters, has been manufactured by the WESTINGHOUSE BRAKE & SAXBY SIGNAL CO., LTD., 82, York Road, King's Cross, London, N.1, primarily with a view to assisting the teaching of the principles of rectification in universities and technical colleges.



The Westinghouse laboratory unit

The set complete in its case measures 14¼ in. wide by 7¼ in. deep by 22 in. high, and it is arranged for bench mounting. The half-wave metal rectifiers are rated at 1 A at 35 V when used in a three-phase full-wave circuit. Each of the transformers has its primary winding tapped for 200-230-250 V, 50 cycles, with secondaries giving 0.9 A a.c. at 32 V r.m.s. Full details of the set with circuits and method of operation are given in a small textbook obtainable from the makers. This laboratory rectifier set can also be utilised for the charging of batteries, in which case a ballast resistance or reactance will be required to prevent excessive currents with voltage fluctuations.

Portable Power Rammers

An electrically operated rammer has been designed by MESSRS. C. H. JOHNSON & SONS, LTD., Somerset House, Brazil Street, Manchester, for pre-cast concrete and artificial-stone manufacture and for foundries. The ½-h.p. motor, which is built into the head, is provided with a rotor that is claimed to be indestructible under short-circuit. The starter, also in the head, can be operated while holding the handle. All parts of the rammer are of high-grade steel and light metal alloy, and the weight is 28 lb. for one of the two models available and 42 lb. for the other. Any size or shape of foot can be provided.

The Johnson electrically operated portable power rammer

Another machine, weighing 140 lb., is designed for cable-trench reinstatement. The power is obtained from internal combustion, and the fuel consumption (benzol) is about 1¼ pints per hour. The rammer foot is 6 in. square.

Hot-water Radiators

The new "Warmo" self-contained portable hot-water radiators recently introduced by MESSRS. ARTHUR PREEN, LTD., 48, Mortimer Street, W.1, have been developed directly as the result of inquiries for electrical equipment similar to the company's oil-heated radiators. There are two models, the "Major" and the "Minor," which cost £6 10s. and £5 10s. respectively; these have radiation surfaces of 16 sq. ft. and 12 sq. ft., and are loaded at 1,000 W and 750 W. They follow conventional design, and are provided with castor wheels.

The radiators proper are made from high-grade cast sections, eight for the larger and six for the smaller models, and the horizontally disposed immersion heater at the bottom is of

The two new "Eddo" fires

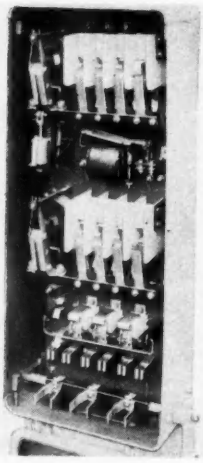
D

orthodox water-heater equipment design. The overall height of both models is 26 in. and the depth 6 in., while the "Major" measures 18 in. wide and the "Minor" 16 in.

An A.c. Push-button Starter

The "M. & C.S." a.c. push-button starter (type A.279) has been designed for "star-delta" starting squirrel-cage induction motors of 7½ h.p. at 220 V, 15 h.p. at 440 V, and 25 h.p. at 660 V, provided the starting current does not exceed 75 A.

With t.p. star contactor, t.p. delta contactor, operating relay, overcurrent trips and "start-stop" push buttons, timing between star and delta connections is obtained by retaining the "start" push button until the motor accelerates. Remote "start" and "stop" can be used, but not float switch, &c., control. Alternatively, a timing device can be added to changeover from star to delta automatically, making the starter suitable for float switch control.



The M. & C.S. push-button starter

Either type can be fitted with a t.p. isolating switch interlocked with the cover. The making and breaking point is remote from the running position, which is unusual in small capacity contactors. The operating coil can be readily removed and arc shields are provided.

The timing device is actuated by a star contactor, and upon closing releases a spring-loaded centre hinged arm to which is coupled an oil lag restraining plunger, with quick return valve at one end and a contact at the other. After a predetermined time of from 5 to 20 seconds, depending upon spring adjustment, contact is made for the operating relay coil circuit, which in turn opens the star contactor operating coil circuit and closes the circuit for the delta contactor operating coil. Delta and star contactors are electrically interlocked. An auxiliary contact on the delta contactor opens circuit for the operating relay coil, the relay then returning to the start position.

The operating relay is provided with make and break contacts. The armature is self-aligning and has shading rings on the magnet to ensure silent operation. The overcurrent trips are of the thermal type, but the bi-metal strip does not carry current and is, therefore, of the same relatively heavy section throughout, while the heating elements are enclosed in fireproof troughs. Each phase unit is provided with three individual adjustments and the trigger of any one operates on a common trip bar. Undervoltage protection is inherent in the contactors.

The start and stop push buttons are mounted in the cover and actuate contacts on the base, a novel feature which simplifies construction. The stop button also functions as the hand resetting device for the overcurrent trips; thus the starter cannot be held in against an overload. The isolating switch is of the "U" blade type arranged for external hand operation and interlocked with the cover.

The three types available from the makers, M. & C. Switchgear, Ltd., Kirkintilloch, Glasgow, are totally enclosed, waterproof and flameproof.

Typerlite Domestic Standards

"Typerlite" standards, which hitherto have been made for desk use, are now available specially designed for pianos, either of the grand or upright type. The weighted felt-lined base enables the adjustable stem to be tilted to any angle without the standard overbalancing. The top stem has a flexible metallic tube fitted with an adjustable knuckle joint and push-bar holder, by means of which the light can be directed at any angle.

The "Typerlite" piano standard

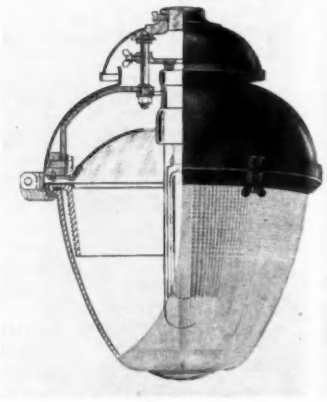
The shades are shaped in such a way that the light falls directly on the music score and at the same time is shielded from the player.

The price of the lamp in the standard finish of steel bronze is £2 (without shade), although at slight extra cost florentine bronze, matt brass and oxidised silver finish is available from the makers, the "TYPERLITE" COMPANY, 86, Cannon Street, London, E.C.4.

A Bowl Refractor Lantern

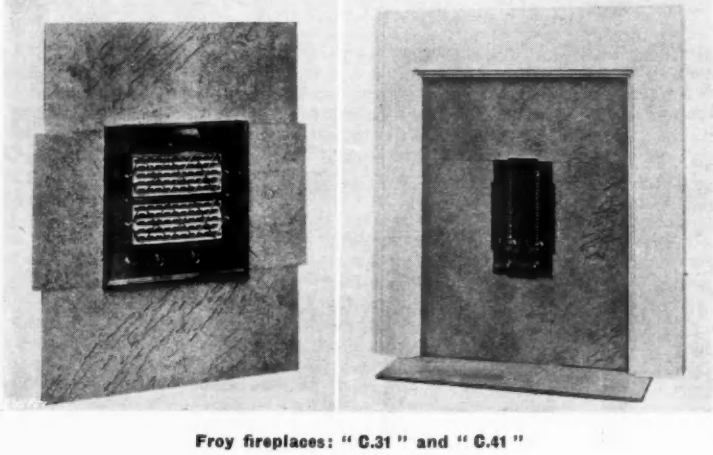
The Holophane two-piece bowl reflector has been designed for use with vertical electric discharge lamps and gives two-way non-axial light distribution.

The outer globe which is smooth over the whole of its exterior surface carries groups of vertical prisms and shallow flutes on its inner surface. The prisms are arranged to concentrate the light into two main beams at 160 deg. to each other. A stepped arrangement of diffusing flutes replaces the prisms on the section facing the roadway. The second member is an inner refracting band, which carries horizontal prisms. These prisms are adjacent to the outer globe and in conjunction with the upper reflector ensure a uniformly luminous appearance over the whole of the surface of the globe.



The Holophane two-piece bowl reflector

The lantern which carries the refractor has been constructed with a number of novel features. The main weight is taken from a cast top boss through heavy-gauge rods and skeleton sectional supports to cast lower rings which are hinged. Incorporated in the body is a chromium-plated reflector of special design, and the lampholder is adjustable. The price is £5 5s., and the makers are HOLOPHANE, LTD., Elverton Street, Vincent Square, London, S.W.1.



Froy fireplaces: "C.31" and "C.41"

Modern Fireplaces

MESSRS. W. N. FROY & SONS, Brunswick Works, King Street, Hammersmith, W.C., have long been specialists in fireplaces for both electric and coal fires. Six new designs have recently been introduced, including the two illustrated below. The "C.41" suite has a mantel in white wood primed with a surround of Loupinnes marble with the hearth to match. A 2-kW fire with chromium plated reflectors is incorporated. A similar design, but incorporating a non-reflector fire of the same type as that used in type "C.31" forms the basis of type "C.42."

Designs are available with panelling which can be obtained in lunel rubane stone, Roman stone, Loupinnes marble, manu-marble (imitation-marble) or "Terrazo" (made from marble chippings), while further models have a slabbed tile wall panel: the "Hugh" incorporates a reflector fire and slabbed tile surround which is, in turn, surrounded by a mantel obtainable in various woods.

Lighting Demonstrations in Lancashire

In conjunction with the Lancashire Electric Power Company the E.L.M.A. touring demonstration van has recently visited Ormskirk and Chorley and large audiences of the right kind were secured in both towns. On each occasion the exhibition was confined to two days and the necessary publicity campaign was planned so as to be at its height when the E.L.M.A. van and lecturers came on the scene. At Ormskirk, an old market town, the gas undertaking is in the hands of a small company. The local councillors are, however, to be commended for taking a broad and impartial view in regard to any conflicting interests of utility companies, their attitude being that they are prepared to show interest in any activity which may be of benefit to the town, and they definitely regarded the lighting exhibition as coming under this heading.

Mr. J. B. Gorst, Chairman of the Ormskirk Urban District Council, declared the exhibition open on October 4th, after having been received by Mr. J. Purrett, assistant engineer and manager. A special session for shopkeepers followed and next morning the Ormskirk Grammar School allowed about fifty boys and girls to attend, and in the afternoon there was a special lecture-demonstration for the Ormskirk Townwomen's Guild and the Ormskirk branch of the Electrical Association for Women. A concluding lecture-demonstration was delivered the same evening to a number of the leading architects, builders, and electrical contractors of the district.

Ormskirk Parish Church, within a stone's throw of the lecture hall, was floodlighted. This floodlighting was brought into use some days before the exhibition and it set all Ormskirk talking and focused interest on electricity and the demonstrations. Temporary modern lighting installations were installed free of charge in important shops in the town to show that considerable improvements could be obtained by doing away with less efficient fittings. After business hours lighting was also permitted free of charge to certain shopkeepers.

In the case of Chorley, a bigger town and largely dependent upon cotton and, consequently, feeling the depression very acutely, somewhat similar arrangements were made. Here, however, the gas undertaking is in the hands of the Corporation, and it is certainly a tribute to the excellent relationships between the local and the head office staffs of the L.E.P. Co. on the one hand and the Town Council on the other that the Mayor and councillors took a sufficiently broad view to officially open the exhibition. Again, in this case after the official opening by the Mayor, Ald. P. H. Hodgkinson, who was received by Mr. C. D. Taite, engineer and manager of the company, a special session for the Chamber of Trade took place presided over by Mr. A. V. Tootell, the chairman of the local branch of that organisation.

The Mayor of Chorley opening a lighting demonstration, and (right) the floodlighting of the Ormskirk Parish Church

The following morning, thanks to the close co-operation of the Secretary of Education, about 1,400 children attended various sessions devised in keeping with their age and stage of development. A most successful demonstration for women held in the afternoon was attended by 150 people, and the concluding session was again that arranged for architects, builders, and electrical contractors. This was presided over by Mr. Q. Mangnall Bluhm, D.S.O., F.R.I.B.A., president of the Blackburn, Preston and District Society of Architects. The clock tower of Chorley Town Hall was floodlighted and the company's showroom windows were made available for local traders to dress and display their goods so that they might see the marked improvement of displaying their wares in a properly lighted shop window.

Intensive work was carried out for the fortnight preceding each demonstration. The publicity work included the displaying of posters on public hoardings, in contractors' windows, on delivery vans, and in showroom windows. Lantern slides were displayed at local cinemas. Full page advertisements were taken in the local Press supported by subsidiary advertisements and a great amount of editorial support was obtained previous to and during the demonstrations. Every consumer in the towns and villages surrounding them received a personal invitation card and thousands of handbills were distributed from door to door on the eve of the opening demonstration day. The lectures by the E.L.M.A. staff were well delivered and very favourably received, and the educational value of the enterprise as a whole was immeasurable.

French Electrical Imports and Exports

The French imports and exports of electrical machinery and apparatus and cognate goods during the first six months ending with June last, as compared with the corresponding period of 1933, are shown in the appended tables. The values are given in thousands of francs, while for purposes of comparison the sterling value of the totals, converted at the rate of 75 fr. to the £, is added.

As will be seen, the imports during the half-year show a decline of £385,505, or over 134 per cent. The falling off was fairly general over the various items scheduled, only two showing an increase. On the export side the six months' total amounts to £1,484,800, or £141,945 (8¾ per cent.) less than a year ago. Of the twelve scheduled items only four show an increase.

	Imports, January–June, 1933. 1,000 fr.	1934. 1,000 fr.
Dynamo-electric machinery and transformers ...	26,714	24,419
Telegraph and telephone and other electric apparatus	88,521	87,399
Dynamo and motor parts	3	10
Incandescent lamps and radio valves	37,942	28,364
Arc lamps and parts	103	65
Carbons for electric and industrial purposes	3,997	3,121
Electric wires and cables	30,485	16,958
Parts of electric apparatus	7,940	9,853
Magnets other than electro-magnets	715	675
Accumulators and parts...	1,690	1,355
Dry batteries and condensers	8,844	6,139
Porcelain and other insulators	1,575	1,258
Total Fr.	208,529,000	179,616,000
Total at 75 Fr. to £	£2,780,385	£2,394,880

	Exports, January–June, 1933. 1,000 Fr.	1934. 1,000 Fr.
Dynamo-electric machines and transformers ...	22,408	20,713
Telegraph, telephone and other electric apparatus ...	42,433	42,386
Dynamo and motor parts	3	77
Incandescent lamps and radio valves	9,850	10,062
Arc lamps and parts	108	88
Carbons for electric and industrial purposes	6,353	7,177
Electric wires and cables	14,876	10,025
Parts of electric apparatus	8,929	9,071
Magnets other than electro-magnets	163	19
Accumulators and parts	7,611	6,015
Dry batteries and condensers	1,178	1,162
Porcelain and other insulators	8,094	4,565
Total Fr.	122,006,000	111,360,000
Total at 75 Fr. to £	£1,626,745	£1,484,800

Engineers and Trade Questions. By Business Man

THOSE who are in the habit of weighing up the possibilities of new movements designed to bring greater success to British electrical and engineering industries will consider it all to the good that engineers are coming to see that as individuals they can contribute more efficiently to our sound progress if they together investigate some of the economic problems which affect their own particular branch.

But if I may say so I do not think that they make a very gracious beginning by suggesting, as Mr. Harrison is reported to have done at Liverpool (ELECTRICAL REVIEW, Oct. 19th, p. 557), that as the economists have proved themselves to be wrong, engineers should come in and find the way. Such a remark reminds one of the long-established antagonisms between commercial and technical staffs which let loose a lot of ill-feeling and never seemed to do anybody a bit of good.

Something like the same attitude is noticeable in the letters appearing in last week's ELECTRICAL REVIEW, and in some of its signed articles in other issues, where one kind of electrical salesman elects to reflect upon another. Competition and rivalry in respect of fitness may help the common cause, but the supercilious manner were better absent from all such discussions, whichever side is inclined to adopt it. Anybody who has made a close study of electrical development knows that if we have a successful electrical industry we owe it to the work, both past and present, of all classes of men; there are many examples both among the technically and the commercially qualified of outstanding contributions.

Many readers of the ELECTRICAL REVIEW, I do not doubt, are old enough to recall blunders which have been made by engineers who, though brilliant on the scientific side, have been so obsessed with technics that they have lamentably lacked the ability to understand the business or economic side of an engineering proposition, say, for example, whether it would pay in pounds, shillings and pence, as well as in efficiency to install this piece of machinery or that or to do without either.

When I read panegyrics on the engineer as the great man of affairs who is most qualified to run the earth and is a sort of saviour of the human race, I recall men who have filled leading places in the building-up, organisation and development of some of our electrical and engineering industries but have come from the class of commercial men who have devoted five or six years, say, from the age of about 16 or 17 to 21 to 22, to the many complex studies that form a solid foundation for accountancy and business leadership along sound lines. When such have finished their course of study their work brings them into contact with the operations of actual industrial and other companies in whose books they are able to see both the good and the bad points. They have successfully re-organised businesses which without their aid would have had to close down.

The young engineer during the same years devotes his mind almost exclusively to all those technical matters that the college and the works require. And after that? If he gets on to the business side almost immediately he may stand the chance of becoming a competent and successful commercially minded and industrialised engineer.

The Institution and Economics

One of the best moves taken in his interest in recent times is that of the Institution of Electrical Engineers, which now gives him some encouragement to follow economics as an alternative in his examination subjects. This is excellent for a fair proportion of candidates, but it does not justify members of engineering study groups in imagining that they will be able to act as substitutes for, or will enable manufacturers or electricity undertakings to dispense with, the specialised services of the economist, or if the term be preferred—the business man.

Let us admit frankly that we have all been wrong to some extent in the past and not waste our time in allotting the blame to the other fellow. Nobody will dispute the usefulness to the industry and to the profession of many engineers adding to their knowledge of economics, or will question the wisdom of economists being enabled to appreciate better the things that exercise the mind of the engineer. It is most desirable to raise the standard generally. We shall, however, after all, still find a use for many engineers who are contented to be engineers, and economists who are contented practically to apply their knowledge of economics, law, and business administration through the accustomed channels. Both have their quite legitimate spheres of operation and many men in each of these professions are ambitious to succeed in their own particular branch.

We cannot all be engineer-economists; there is no call that we should be so. It is conceivable that an engineering student would sometimes become a poor engineer because he dabbled in other matters when he should be improving his technical qualifications and gaining experience. Equally probable is it that some economists would become far less efficient at their own game by mixing engineering with their other studies. These thoughts do not, of course, bear upon the man who definitely intends to become a specialist combining the main qualifications of both kinds, rendering him an engineering business man for management, trade research and development, finance, organisation, and so forth—a type of man for which there is believed to be a quite definite need.

The accountant and the economist have a basal training to fit them for certain necessary functions in practically any branch of industry. The engineer, speaking generally, cannot claim that his special training fits him to branch out successfully into any kind of trade or industry. He may scrap his engineering career, because he does not see his way to early success therein, and run a wayside hotel or other undertaking, but he will find a certain amount of business ability necessary in order to make it succeed.

What, I wonder, do readers of the ELECTRICAL REVIEW think regarding these matters? As a trade journal as well as a technical one it should contain the views of both sides of what is in my view an important industrial question. The electrical industry—particularly the electricity supply section of it and the export trade department—can do with all the sound business thinking and progressive action that can be imparted to it in these days, for electricity sales and overseas orders are among the chief matters upon which we should concentrate intensively right now. If the influence of the economic study groups helps us in these directions we shall have very good reason to be thankful for the movement.

Help for the Coming Men

One of the most important questions that exercises the mind of the young engineering student, electrical or otherwise, when his college career is drawing to a close is: "What kind of a job shall I try for when I am through here?" He has spent his years studying and in the works and knows well enough that his parents have carried him as long as they can afford to do so, or at any rate he wants to "get on to his own feet." Somebody advises him to be careful not to get into a groove on the technical side. Somebody else praises the business side as holding out more remunerative chances. But he ends in being governed by circumstances and taking the first job that is offered.

Now these economic groups should be very useful to young men who are just leaving the college or the works, for if the proceedings are conducted along the right lines and relate definitely to matters bearing upon an engineering career, they will give him a large view of things and enable him to form a sane judgment concerning what is happening in engineering industrial countries other than his own; what are the prospects for engineering developments in the world generally; and what part it may be possible for him as a British engineer to play in the next thirty years or so.

I sometimes study advertisements of "Situations Vacant" in various papers because they are instructive regarding tendencies. One that appeared in the ELECTRICAL REVIEW last Friday interested me. It said: "Progressive firm of manufacturing and electrical engineers require the services of a young man of good education—age not exceeding 25 years. Degree in electrical engineering an advantage but not essential. Good opportunity for keen adaptable man with initiative."

Note that stress is laid upon the man being young, having a good education, possessing initiative and being very adaptable. Less value is placed upon a degree in electrical engineering provided that the applicant possesses these other excellent qualifications. Of course, I do not know what the particular job is but I am inclined to think that the advertiser is looking for an all-round man rather than a brilliant technician. It may be that the group discussions and the Institution examination alternative will add to the availability of men of this type.

Electric Furnaces in Russia

In a recent issue of the French *Journal du Four Electrique*, Prof. M. L. Aronoff, of Moscow, gives some particulars of the present position with regard to the use of electric furnaces for the production of special steels and alloy metals and in the electro-chemical industry in Soviet Russia. The author estimates that at the commencement of the current year there were 267 such furnaces, of a total capacity of 310,000 kVA, in use in that country, while a further 178 furnaces (273,000 kVA) are expected to be added during 1934, bringing up the total to 445 with an aggregate capacity of 583,000 kVA.

In the Courts

THE case of Clifford and wife *v.* the Ilford Borough Council came before Mr. Justice Swift and a common jury on October 17th, it being an action by Mr. John N. H. Clifford and his wife, Mrs. Charlotte Clifford, of Eastern Avenue, Ilford, to recover damages for personal injuries suffered by Mrs. Clifford through the alleged negligence of the defendants as the electrical undertakers for their district.

The facts of the case as stated by Counsel for the plaintiffs were that in October, 1932, they hired an electric cooker, kettle and iron from the defendants, who executed at the house the necessary wiring installation. The plaintiffs alleged that the switch control for the kettle was placed on the earth side of the plug so that when the switch control was turned off the electric current still passed to the plug and on to the kettle when it was connected to the plug, by reason of which a person touching the kettle, which was defective, might inadvertently cause the circuit to be completed to earth through his body.

On April 8th, 1933, when the kettle in question was connected with the plug and when the switch control was turned off, Mrs. Clifford, while picking up and/or holding the kettle, received a severe electric shock, causing her great pain and suffering and expense

The defendants admitted liability and that there was a defect in the wiring, and therefore the only question was the amount of the damages to which the plaintiffs were entitled.

After hearing the evidence of Mrs. Clifford and the medical evidence called on behalf of the plaintiffs and the defendants the jury returned a verdict for the plaintiffs for £300 damages and in addition £102 12s. special damages, £402 12s. in all, for which amount judgment was entered for them with costs.

A Change-over Dispute

In the Chancery Division on October 19th Mr. Justice Clauson heard a motion by Tenants' Services, Ltd., 73, Eaton Square, W., for an interim injunction restraining the Westminster Electric Supply Corporation, Ltd., from withdrawing its supply of electricity.

Mr. H. B. Williams, for the plaintiffs, stated that for many years the defendants had supplied the premises with electricity by means of direct current. The dispute that had arisen was due to the fact that the Corporation had obtained the necessary sanction to change its system to alternating current, and the question was who was to bear the expense of converting the plaintiffs' plant to be suitable for a.c.

His Lordship said that there was no obligation upon the defendants to supply plaintiffs with direct current. They should change their apparatus and sue the defendants for the cost if they thought that they were liable to pay it.

Mr. Williams said that he was not quite sure that he had that remedy. His Lordship said that counsel had not given him any ground for granting an injunction. The motion would be dismissed and the costs would be the defendants' costs in the action.

Battersea Power Station Fees

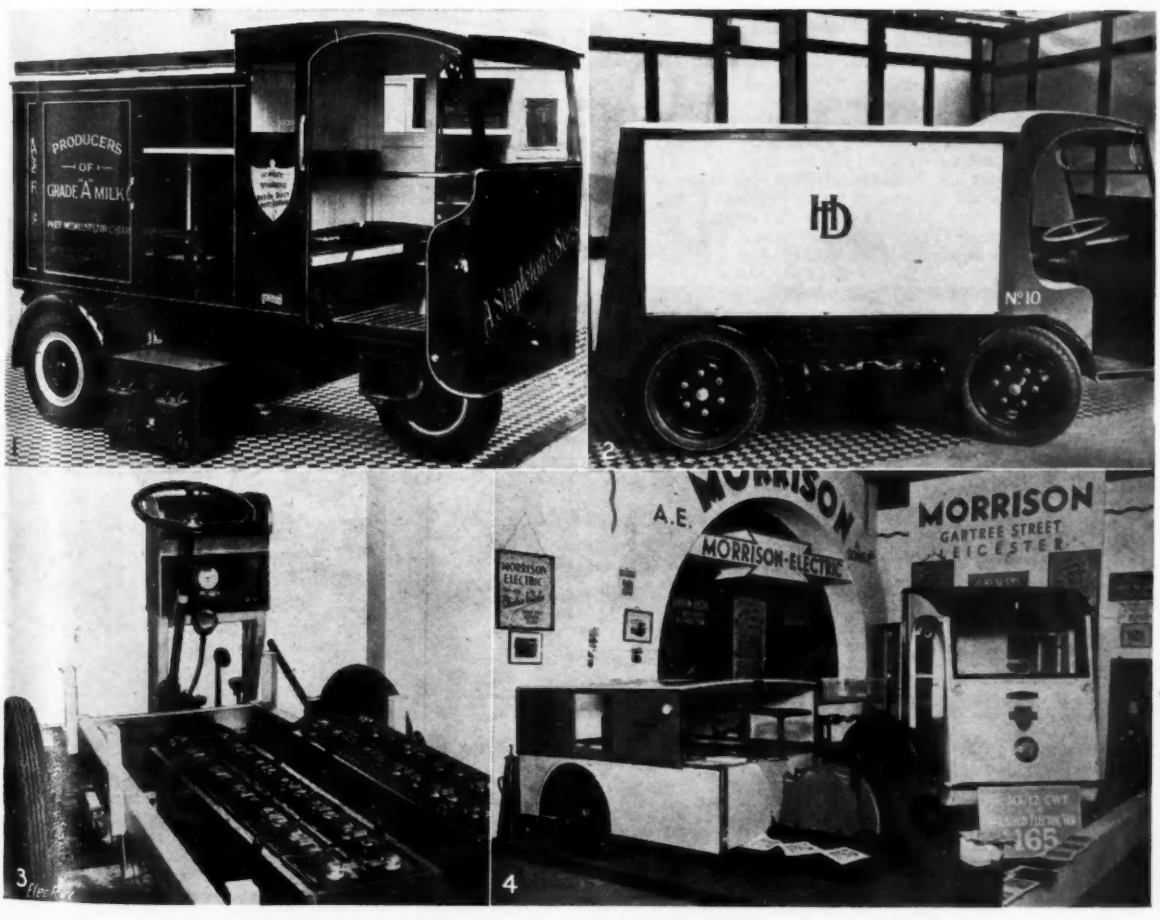
The Court of Appeal, consisting of Lords Justices Greer, Maugham and Roche, at the conclusion of the arguments on October 22nd reserved judgment on the appeal of Mr. A. Lane, district surveyor of Battersea, from the judgment of a Divisional Court of King's Bench reversing a decision of the magistrate at the South-Western Police Court, who held that Messrs. John Mowlem & Co., Ltd., the builders and contractors, were liable to pay to Mr. Lane the sum of £476 10s. as fees he alleged to be due to him under the fifth schedule of the London Building Act, 1930, in respect of the building of the Battersea power station for which Messrs. Mowlem were the principal contractors.

Compensation Claim

On Friday last the hearing was begun at the County Court, Stafford, before His Honour Judge Ruegg, K.C., of an action by Florence May Keeley, Friar Street, against the English Electric Co., Ltd., for an award under the Workmen's Compensation Act in respect of the death of her husband, William Thomas Keeley, an employé of the company, who died on June 8th following an electric shock sustained while working at a Central Board sub-station at New Mills, Derbyshire.

Mr. E. G. H. Berresford, who represented the plaintiff, said that the deceased had been in the employ of the company for over twenty years and when the accident occurred was working with another man Angus on some 33,000-V switchgear. A switch had been made "dead" while the work was in progress, but had been put on again when the accident occurred. Angus had said that he was quite aware that the switch was alive again. There was no suggestion of suicide.

For the company Mr. J. D. Healey said that the amount of compensation was not disputed, and if a decision was made in favour of the plaintiff the maximum award of £300 would probably be made. He maintained that according to the evidence Keeley had no business to be at the switches at the moment of the accident. The hearing was adjourned.



Some Electric Vehicles seen at the Dairy Show (p. 569)

1. The Taylor-Metrovick milk delivery van with battery charger alongside. 2. The "Nelco" milk-roundsman's vehicle with battery cover removed. 3. "Electricar" chassis with new foot-pedal control. 4. The Morrison "Trilec" and covered van

Business and Industrial Notes

The Week's Electrical Trade News from all Sources. Commercial and Industrial Developments, Business Changes, Market Prices for Materials, Trade Openings, New Publicity Literature, Liquidations, and Failures

Wages in the Contracting Industry

Earlier this year it was agreed between the National Federated Electrical Association and the Electrical Trades Union that the operation of the sliding-scale agreement relating to wages in the contracting industry should be suspended from the second pay-day in April to the first pay-day in October. Since the latter date the existing rate has been kept in force, but it has now been arranged that as from the first pay-day following October 22nd the rates for the various grades shall be increased by ½d. per hour. The new rates will be as follows: Grade A, 1s. 9½d. per hour (including the 5 per cent. addition); Grade B, 1s. 6½d.; Grade C, 1s. 5d.; Grade D, 1s. 3¾d.

Employment During September

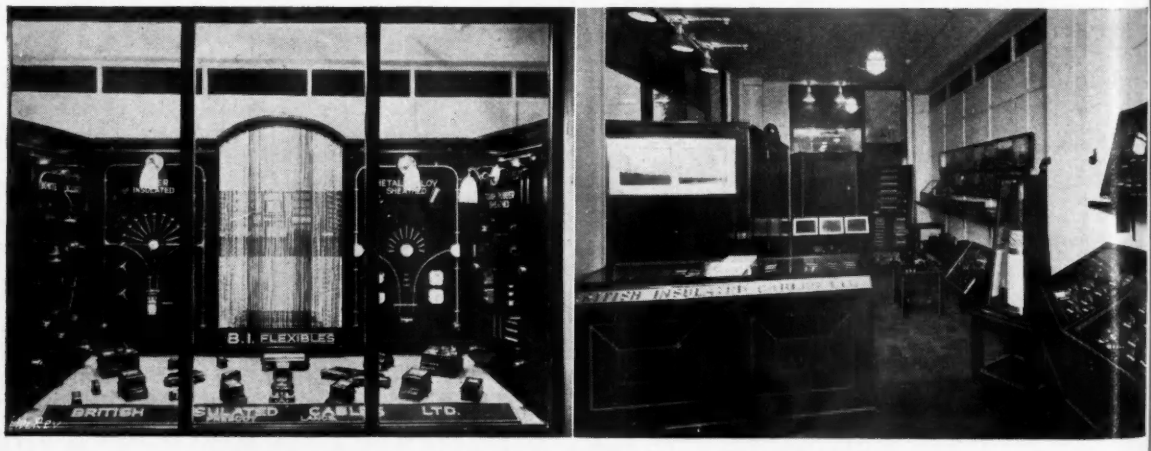
Employment in the engineering industry during September showed little change on the whole as compared with the preceding month, but conditions in the electrical engineering section continued to improve and were fairly good. According to statistics published in the *Ministry of Labour Gazette* the number of unemployed in the engineering industry totalled 133,126, a decrease of 856, as compared with the previous month, the percentage falling slightly from 14.0 to 13.9 (in September, 1933, the figure was 21.3 per cent.). In the electrical engineering section the number of unemployed was 6,282, the proportion falling from 7.2 to 6.9 per cent. (13 per cent. in September, 1933). In the electric cable, apparatus and lamp manufacturing group, the number of unemployed showed little change at 9,365, as compared with 9,468 in the preceding month. Unemployment in the electrical wiring and contracting industry showed a slight increase at 4,943, the percentage being 17.9 against 17.8 (16.8 in September, 1933).

Dundee and Foreign Cable

Dundee Corporation Electricity Committee at its last meeting accepted Belgian offers for cables in preference to British, which were 17 per cent. dearer. The Belgian offer was £2,881 and the British £3,297. Plus the carriage on drums the British offer amounted to £3,367. The Belgian offer contained a guarantee that the whole of the jute required for the cables would be purchased and manufactured in Dundee. The convener pointed out that the Belgian manufacturers had to pay 20 per cent. import duty, so their offer was really 37 per cent. lower than the British price. It was explained that the Corporation had agreed to accept British offers in preference to foreign where the difference was not more than 10 per cent.

New B.I. London Showrooms

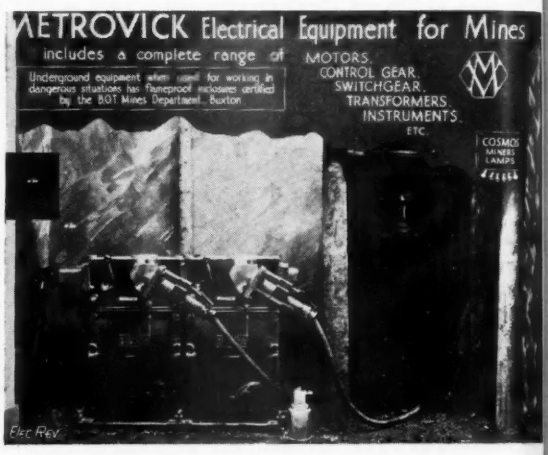
Although British Insulated Cables, Ltd., has for many years had London offices, it has not hitherto provided clients with facilities to inspect its products. This position has now been remedied by the opening of new showrooms at 14, Savoy Street, W.C.2, which stand on a corner with windows and entrance facing Victoria Embankment. The site is a good one, as the showrooms are only a few yards from the I.E.E. building. The window displays are interesting. One window contains a selection of fittings for overhead transmission of all kinds. A second window shows copper and aluminium sheets and sections, rolled and extruded at Prescot, and an effective feature is the B.I. trade-mark carried out on a large scale in copper framed by aluminium. The third window shows the various B.I. wiring systems, together with the latest fuse boxes and other fittings. The display in this window has an original background in the shape of a hanging curtain composed of multi-coloured flexibles. Inside are shown the larger products of the company. One corner of the showroom is devoted to a display of the latest pattern B.I. welder, and four of these are actually in operation. Another novel and instructive exhibit consists of two showcases which demonstrate by samples the progressive stages in the manufacture of power and other cables. The showroom is also a museum of the history of cable-making. There are many interesting examples of early and unusual cable sections, one showcase containing a range of very early cables laid by the company some of which were installed in the London area as far back as 1886.



Once of the display windows and a corner of the new B.I. London showrooms

A Coal Mine Window Display

The current display of the Metropolitan-Vickers Electrical Co., Ltd., in its window at Crown House, Aldwych, W.C., vividly portrays the conditions under which mining gear has to work. Two "MU80" gate-end boxes are shown, suitable



A "Met-Vick" window display of mining equipment

for controlling a coal conveyor and a coal cutter, and cables run to these units along a passage leading to the coal face. A realistic effect is obtained and the lighting in the passage appears to be from a standard miners' handlamp.

An Electrical Exhibition at Cannock

An electrical exhibition, organised by the Cannock U.D.C. Electricity Department, with the assistance of E.D.A., will be formally inaugurated by Sir William Ray on Monday next, and will continue throughout the week. A comprehensive display of domestic appliances will be on view, and Mr. P. Wardle, the chief engineer and general manager of the electricity undertaking, has secured the aid of a large number of exhibitors. These include the following: Messrs. Barber & Wilkes; Berkeley & Young, Ltd.; Berrys Electric Ltd.; Burnley Components, Ltd.; Cannock U.D.C. Health Department; Carron Company; Electric Construction Co., Ltd.; English Electric Co., Ltd.; Lighting Service Bureau; Ferranti, Ltd.; General Electric Co., Ltd.; L. G. Hawkins & Co., Ltd.; Hotpoint Electric Appliance Co., Ltd.; Hoover, Ltd.; Jackson Electric Stove Co., Ltd.; Johnson & Phillips, Ltd.; Modern Washways; Revo Electric Co., Ltd.; Santon, Ltd.; Simplex Electric Co., Ltd.; and the Truman Electrical Co.

The Electricity Department will have an information bureau and continuous demonstrations and instructional talks will be given each day.

Power Factor Correction

Messrs. Crompton Parkinson, Ltd., inform us that they have supplied approximately 170,000 h.p. of auto-synchronous motors for use in this country and abroad, the average horse-power of the machines being well over 200. Twenty-seven large concerns alone have bought between them 256 of these machines, totalling 84,000 h.p. These figures give an interesting indication of the extent to which the problem of power-factor correction has been tackled in recent years.

Another Meter Problem

Again there is trouble in the Far East. One of our manufacturing friends received the following letter from that unsettled region a few days ago:—

"Dear Sirs,—

We shall be glad to receive your lowest quotations for the undermentioned small motor engine, for producing the ellectricity to light three or four bulbs on 5.w ellectric table fan.

This sort of engine is required for the villagers where the power is not available. Can you recommend to oil engine of the same power to meet this purpose. Villagers wants to store the ellectricity at a minimal cost in their houses.

Besides this we shall be highly grateful to you if you will please find any method of formula to know the speed of the ellectric metre, whether it runs fast or slow. The Ellectric Supplying Co. of this City have supplied the ellectric German metres made by Germany. Their metres are going too fast and thus the consumers are paying double cost.

If the metres manufacturers have invented any apparatus to test the speed of metre is available on sale, you may send us one by post and cost will be paid on the receipt of same, by postal order.

We can assure you there are hundreds of hundred person who wish to buy the metre examiner for their own private use. Thanking you in anticipation,

Yours faithfully,"

It is apparent that the Far East shares with the nearer home the belief that "ellectric supplying companies" use meters that always err on the wrong side.

The Glasgow Corporation Electricity Department's stand at the Housing and Health Exhibition

Blackpool Illuminations

A party of members of the Farnworth and District Branch of the Electrical Association for Women went by motor coaches to Blackpool on October 18th to see the electrical illuminations. Tea was served in the Baronial Hall, Winter Gardens. Mr. Charles Furness, the borough electrical engineer, who was present with Mrs. Furness at the tea, gave a brief outline of the progress of the illuminations since their inception in 1912, and congratulated the Association on its useful work. A spectacular floodlighted lifeboat display and fireworks concluded the visit.

Cooking Demonstrations at Coventry

An experimental effort was made by the General Electric Co. last week to encourage the use of "Magnet" cookers in the homes of its own employés by giving cooker demonstrations at the Coventry Telephone Works. The demonstrations were staged in the large dancing hall of the works social club, and employés with their families and friends were personally invited. The hall was filled at each of the five demonstrations given, the aggregate attendance being 3,500; the provision of a special "pram" park and playroom for children was a refinement in organisation much appreciated by parents. The chairman of the Corporation Electricity Department, Councillor Adams, and the chief electrical engineer, Mr. W. J. Marston, took an active part in the proceedings. A crisp and racy duologue was spoken between two dummy parrots appropriately garbed and perched one on each side of the proscenium. The humorous exchanges of these "artistes" had reference to a skilfully arranged setting on the main stage of two kitchens side by side, one representing in realistic detail the dirt and grime of the "old" way, and the other the bright and cheerful cleanliness of the modern electric kitchen. This amusing "curtain raiser" was followed by an exhibition of practical cooking by the G.E.C. chief demonstrator, Mrs. Flack.

Ancient and modern ways of cooking: An effective demonstration at Coventry

Housing and Health Exhibition

At the Housing and Health Exhibition, which is now in progress at Kelvin Hall, Glasgow, the stand of the Corporation Electricity Department is a prominent attraction. Mr. H. Bell, the general manager of the electricity undertaking, informs us that the stand is a "tie-up" in an extensive Press advertising campaign promoted by the Electricity Department to introduce cheap electricity into the home for all purposes. The idea of all-electric homes for the artisan is by no means a fantastic one in Glasgow, and the model of a kitchen in a tenement house, familiar to the Glasgow public, shows the uses to which electricity can be put in the home under the easy hiring schemes, and low-priced electricity now obtainable from the Electricity Department. A two-gallon hot water tank is erected over the kitchen sink and an immersion heater is shown fitted into the hot-water tank to supply hot water for baths and washing-up when the kitchen fire is let down during hot weather. An electric cooker is placed in a prominent position to catch the eye of the visitor. Daily demonstrations are given of electric cooking and baking Another feature of the stand is electric clothes washing machines with trained demonstrators in attendance. The exhibition closes to-morrow (Saturday).

An Electrical Propaganda Play at Ashford

During an electrical exhibition organised by the Ashford U.D.C. Electricity Department an interesting attraction was an electrical propaganda play produced by the Department, in which "Professor Renovation" passed four "old" ladies through an electrical fire and a "magic" waterfall, during which process they regained their youth. As our picture shows, the experiment was a pronounced success!

A scene from the electrical propaganda play at Ashford

A Cooker Display

At the recent electrical exhibition held at Lytham St. Annes, the Corporation Electricity Department had a display of "Revo" electric cookers, which it hires out. As our picture

A "Revo" cooker display at the recent Lytham St. Annes electrical exhibition

shows, the cookers, arranged around a large wooden model, made an attractive display, a feature of which was a neon sign representing the "Revo" superspeed boiling plate.

Wages in the Cable-making Industry

The Joint Industrial Council for the Electrical Cable-making Industry announces that there will be no "cost-of-living" alteration in wages paid in the industry on the third pay-day in November.

Prices of Materials

The following prices are only general, and they may vary according to quantities and other circumstances:—

CHEMICALS, ETC.	Price. October 24th.	Fortnight's Inc. or Dec.
a Acid, Oxalic ... ... per cwt.	50s.	—
a Ammoniac, Sal ... ... per ton	£40	—
a Ammonia, Muriate (large crystal) ... ,,	£38	—
a Borax ... ... ,,	£17	—
a Copper, Sulphate ... ... ,,	£19 15s.	—
a Potash, Chlorate ... ... per lb.	3¾d. to 4¼d.	—
a ,, Perchlorate ... ... ,,	6d.	—
a Shellac T.N. ... ... per cwt.	£4 18s.	—
a Sulphur Commercial... ... ... per ton	£11	—
a ,, Roll ... ... ,,	£11	—
a Soda Chlorate ... ... per lb.	3¼d. to 3¾d.	—
a ,, Crystals... ... ... per ton	£5 to £5 5s.	—
a Sodium Bichromate, casks ... ... per lb.	4d. nett.	—
METALS, ETC.		
b Aluminium, Ingots ... ... per ton	£100 to £105	—
b ,, Wire ... ... per lb.	1/1 to 1/9	—
b ,, Sheet and Foil... ... ... ,,	1/2 to 2/9	—
p Babbits Metal and Anti friction Metals—		
Grade I ... ... per ton net	£206	—
Grade II ... ... ,,	£142	£1 inc.
Grade III ... ... ,,	£68	£1 inc.
c Brass (rolled metal 2" to 12" basis)... per lb.	6¼d.	—
c ,, Tubes (solid drawn) ... ... ,,	8¼d. to 8¾d.	—
c ,, Wire, basis ... ... ,,	7d.	—
c Copper Tubes (solid drawn)... ... ,,	9¼d.	—
g ,, Bars (best selected)... ... per ton	£56	—
g ,, Sheet ... ... ,,		
g ,, Rod ... ... ,,		
d ,, (Electrolytic) Bars ... ... ,,	£30 10s.	10s. dec.
g ,, ,, Sheets ... ,,	£30 to £30 15s.	£1 5s. to £1 10s.
d ,, ,, Wire Rods ... ,,	£35 10s.	£1 dec. [inc.
d ,, ,, H.C. Wire ... per lb.	6¾d.	¼d. inc.
f Ebonite Rod ... ... ,,	1/6 to 2/– plus	3d. to 6d. inc.
f ,, Sheet ... ... ,,	1/3 to 1/6 } 10%	—
n German Silver Wire ... ... ,,	2/5	—
h Gutta-percha, fine ... ... ,,	nom.	—
h India-rubber, Para fine ... ... ,,	5¼d.	—
i Iron, Pig (Cleveland No. 3) ... per ton	62/6	—
i ,, Wire galv. No. 1, P.O. qual. ... ,,	£20	—
g Lead, English Pig ... ... ,,	£12 10s.	5s. inc.
g Mercury ... ... per bot.	£11/12/6 to £11/15	—
c Mica (in original cases) small ... per lb.	6d. to 3/6	—
e ,, ,, medium ... ,,	4/- to 8/-	—
e ,, ,, large ... ,,	8/6 to 17/6 & up	—
p Phosphor Bronze, plain castings ... ,,	1/1	—
p ,, ,, drawn bars & rods ,,	10¾d.	—
p ,, ,, rolled strip & Sheet ,,	10¼d.	—
p ,, ,, wire ... ... ,,	11¼d.	¼d. dec.
o Platinum ... ... per oz.	£7 15s.	—
d Silicium Bronze Wire ... ... per lb.	7¾d.	¾d. dec.
r Steel, magnet, in bars ... ... ,,	7¾d.	—
g Tin, Block (English) ... ... per ton	£230 10s. to £232 10s.	—
n ,, Wire, Nos. 1 to 16 ... ... per lb.	3/8	—

Quotations supplied by:—

a G. Boor & Co.
b The British Aluminium Co., Ltd.
c Thos. Bolton & Sons, Ltd.
d Frederick Smith & Co.
e F. Wiggins & Sons.
f India-Rubber, Gutta Percha and Telegraph Works Co., Ltd.
g James & Shakespeare.
h Edward Till & Co.
i Bolling & Lowe.
l Richard Johnson & Nephew, Ltd.
n P. Ormiston & Sons.
o Johnson Matthey & Co.
p C. Clifford & Sons, Ltd.
r W. F. Dennis & Co.

The above table is published here fortnightly. In alternate issues, in which it does not appear, the latest prices of copper, silicium bronze wire, lead and rubber, up to the time of going to press, are given in our "Business Notes" under the same heading.

Recent Contracts

The Mirrlees Watson Co., Ltd., has received an order, valued at £30,000, for the supply of machinery for a sugar plantation in Jamaica.

In connection with the establishment of a branch of the Guinness brewery at Park Royal, near London, the Park Royal Development Co., Ltd., has placed an order with Messrs. Henry Simon, Ltd., for the equipment of the granary which is now being erected for the storage of finished malt. The equipment will include a number of band conveyors and elevators for transporting the grain, "Reform" automatic weighers, "Duplex" grain cleaners and separators, and a complete dust-collecting system comprising suction filter dust collectors and fans. The complete electrical equipment of the silo will also be supplied by Messrs. Henry Simon.

Messrs. C. A. Parsons & Co., Ltd., have received an order from Southampton Corporation for a 25,000-kW turbo-alternator, complete with condensing plant. The turbine will be constructed on the Parsons duplex exhaust principle, which will enable it to develop this output efficiently at a speed of 3,000 r.p.m. in a single cylinder.

The new motor ship *Durham*, which has been built for the Federal Steam Navigation Co., has been equipped with an Exide-Ironclad battery of 332 Ah capacity for supplying current to the "Keepalite" installation, which provides for emergency steering and emergency lighting at 220 V as well as for essential lighting while the vessel is in port. A sister ship now building will have a similar equipment.

An Advertisement Correction

We are asked to correct an error which appeared in the advertisement of Edison Swan Cables, Ltd., upon the front cover of our last issue. The electrical contractors mentioned were Messrs. Drake & Gorham, Ltd., not Drake & Gorham Wholesale, Ltd., who supplied the cables.

Our Domestic Special

The price of the "Swan Brand" wash-boiler produced by Messrs. Bulpitt & Sons, Ltd., referred to on page 526, should read 37s. 6d. and not 27s. 6d. as we were informed. The "Rapid" kettle of the same make illustrated on page 520 does not represent the company's latest practice.

The price of the "Cam-heat" utility heater (East London Rubber Co.) mentioned on page 520 is 8s. 9d., not 8s. 6d.

Unity Heating, Ltd., points out that it does not now use the trade names "Electrorad" and "Morganite." These devices are now known as the Unity panel radiator and flood-heat radiator respectively.

The "Norfolk" cleaner (British Electric Equipment Co., Ltd.) costs twelve, not fifteen, guineas.

The "Henletel" Swimming Gala

The Henletel Swimming Club, which is associated with Messrs. W. T. Henley's Telegraph Works Co., Ltd., held its fifth gala at the Holborn Baths, London, on October 19th. The gala saw the culmination of the competition for the City Livery Club Cup, the Gravesend staff being victorious. Other interesting events included ornamental swimming by the Lewisham Ladies' S.C., for which under-water lighting was used effectively; exhibition diving by Messrs. Brewer and Hollister; life-saving by Miss Frêda Cook, aged six; and

Lady Hughman presenting the three-lengths medley race cup to Mr. A. S. Brewer at the Henletel Gala

humorous displays by Messrs. Catford and Thorns. A water polo match, the City Office and Woolwich *v.* Gravesend, was won by the former team. Trophies were presented to the winners by Lady Hughman, and Sir Montague Hughman, chairman of the company, congratulated the club on arranging a very enjoyable programme. Among those present were Mr. and Mrs. Bishop; Sir Maurice and Lady Simpson; Mr. and Mrs. McClelland; Mrs. Salmon; Mr. and Mrs. Jacob; Mr., Mrs. and Miss Anderson; Mr. and Miss Lefeaux; Mr. and Mrs. MacArthur; Mr. and Mrs. Barry; Mr. J. H. Roberts; Mr. Evans; Mr. Wilkins; Mr. Kips; and Mr. Archer. Mr. E. Stanley acted as M.C.

Social Events

There were thrills in plenty at the Fortune Theatre on Monday and Tuesday last when the G.E.C. Dramatic Society gave two performances of "A Murder Has Been Arranged," by Emlyn Williams. The programme described the play as a ghost story in three acts, and the players succeeded thoroughly in creating a tense atmosphere. The cast included many of the players who have become familiar to us through previous sterling performances, and they all came through their latest test with flying colours. Mr. W. Avenell, however, had the lion's share, and as the murderer he dominated the stage, his acting throughout the play being a masterly performance of deep-dyed villainy. The theatre was full for both performances, and the Electrical Trades Commercial Travellers' Association's charities, for which they were given, should benefit substantially.

New Wallasey Showrooms

The new showrooms of the Wallasey Corporation Electricity Department, built on a commanding corner site in Wallasey Road at a cost of £18,000, were opened on Monday last by Ald. J. Hughes, chairman of the Electricity Committee, in the presence of a large gathering of visitors, many of whom came from surrounding towns. The walls in the main showroom are brightly coloured in warm tones of cream or buff, the floors being covered with rubber. A series of alcoves are fitted with different types of electric fires, lighting fittings and modern furniture which are visible from the outside of the premises through non-reflecting glass display windows. One of the main features of this floor is an octagonal decorative fitting, with recessed facings, each of which houses a different type of electric fire. On the table, mirrors are made up into a handsome design and provide an attractive setting for toasters, irons, &c., the whole being surmounted by a massive chromium-plated lamp pedestal. All the woodwork—doors, tables, desks, &c.—is in limed oak. The accommodation in the basement includes a store, main control room, transformer and heating chambers. On the ground floor are an entrance hall and showroom with three large display windows. The first floor contains office accommodation and a demonstration room to seat fifty people. Additional offices are provided on the second floor, while the third floor is reserved for storage and switchgear. At the opening Mr. V. W. Dale (E.D.A.) paid tribute to the able management of the electricity undertaking by Mr. B. V. Hawkins. Among the contractors for the showrooms were the General Electric Co., Ltd. (lighting fittings); Bastian & Allen (thermal storage heating installation); Hawkins & Hunter (wiring); and Etchells, Congden & Muir, Ltd. (electric lifts).

The Skegness Electrical Exhibition

The accompanying illustration shows a general view of an electrical exhibition recently arranged by the Mid-Lincolnshire Electric Supply Co., Ltd., at Skegness. The opening ceremony was attended by members of the Skegness Council and a number of prominent people in the town, and was performed

The electrical exhibition at Skegness

by Councillor F. Wood, chairman of the Council, supported by Mr. L. Giacomuzzi, managing director of the company. The exhibition, which was organised under the supervision of Mr. W. V. S. Scorer, the district engineer of the company, and Mr. L. J. Sutton, the sales engineer, proved very successful, good attendances being reported each day.

Electrode-boiler Heating

One of the difficulties encountered in stating the case for electric steam raising or the heating of buildings by electrode boilers is the tendency of the uninstructed to compare the cost per kWh with the estimated cost of solid fuel at test-boiler efficiencies without allowing for the economies due to the saving of labour and ease of control obtained with electricity. With a view to obtaining authentic data on the subject, Messrs. Bastian & Allen, Ltd., have purchased the exclusive rights for the British Empire for the C.G.S. automatic coal burner. They will continue to supply electrode boilers except where the tariff for electricity is too high or where other considerations make the use of the automatic coal burner the only practicable method.

Trade Announcement

The telephone number of the Scott Insulated Wire Co., Ltd., has been changed to North 1194-6.

New Catalogues and Lists

Simplex Electric Co., Ltd., 159, Great Charles Street, Birmingham, 3.—A list of flameproof lighting fittings for collieries, petrol stores, &c.

F. C. Heayberd & Co., 10, Finsbury Street, London, E.C.2.—Particulars of battery chargers and a new handlamp. Also a booklet dealing with mains radio equipment.

A. J. Coleman & Co., 37, The Arcade, Northampton.—A new radio catalogue.

A.E.G. Electric Co., Ltd., 131, Victoria Street, Westminster, S.W.1.—A booklet on time switches.

A. Reyrolle & Co., Ltd., Hebburn.—Pamphlets on automatic air-break switches and unit-type metal-clad distribution gear.

Unity Heating, Ltd., Vincent House, Vincent Square, S.W.1.—A new heating catalogue.

Brown Bros., Ltd., Gt. Eastern Street, E.C.2.—A very complete 165-page illustrated radio catalogue.

S. Wolf & Co., Ltd., 115, Southwark Street, S.E.1.—A leaflet on the type "BWH" hammer.

Holden & Brooke, Ltd., Sirius Works, Manchester, 12.—Leaflets on a new range of "Siflex" pumps.

Ferguson, Pailin, Ltd., Higher Openshaw, Manchester.—Leaflets on arc control for circuit-breakers; typical short-circuit tests on type "P" cross jet explosion pot; oil circuit breakers, and isolating switches.

Lancashire Dynamo & Crypto, Ltd., Trafford Park, Manchester.—A pamphlet on mining and quarrying.

Sun Electrical Co., Ltd., 118, Charing Cross Road, W.C.2.—The "Sunco" heating catalogue.

Marshall Electrical Co., Ltd., Tottenham Street, W.1.—Price list of accessories.

Hopkinsons, Ltd., Huddersfield.—A booklet on the Hopkinson "Moynan" steam purifier.

Austinlite, Ltd., Lighthouse Works, Smethwick, Birmingham.—An illustrated brochure containing specifications and illustrations of "Austinlite—National" generating sets ranging from 1 to 20 kW. Also an illustrated booklet dealing with the company's automatic Diesel-electric pumping plant.

Bankruptcy Proceedings

H. Pickup, trading as Electrical and Wireless Stores, 12, Frank Street, Barnoldswick, electrical engineer.—The first meeting of the creditors herein was held at the Official Receiver's office, 71, Manningham Lane, Bradford, on October 16th. Debtor said his failure was due to taking over an insolvent partnership business, and insufficient turnover. The gross liabilities amounted to £225, and there was a deficiency of £194. The matter was left in the hands of the Official Receiver.

T. J. Mathews, 40, Rumbridge Street, Totton, Hants, formerly trading at Southampton as "Universal Radio," and at Winchester, wireless dealer.—The public examination was held at the Court House, Southampton, recently. It was stated that the deficiency amounted to £1,516. Debtor attributed his failure to selling goods at cut prices with consequent insufficient profit to cover overhead expenses and drawings; losses on sale of goods under executions; and loss of instalments paid on a motor van. The examination was adjourned, debtor being ordered to furnish a cash and goods account.

C. J. Lockey, 5, Godstone Road, Caterham Valley, Surrey, wireless and electrical dealer, &c.—This debtor's application for discharge was heard at the County Court, Croydon, recently. Debtor filed his own petition last year, and had estimated his ranking liabilities at £141. The assets had been expected to produce £106, but had realised only £70. The unsecured creditors had received a dividend of 11½d. in the £. The discharge was granted subject to nine months' suspension.

F. J. Woolfenden and **J. D. Lister,** electrical and radio engineers, 56, Victoria Street, Littleborough.—Trustee, Mr. R. K. Clark, Byrom Street, Manchester, Official Receiver, released October 12th.

C. G. Lowe (Teleradio & Electrical Supplies), radio and electrical dealer, 77, Lansdowne Road, West Didsbury, Manchester.—Trustee, Mr. F. Murgatroyd, Byrom Street, Manchester, Senior Official Receiver, released September 6th.

J. O. Storey (J. Storey & Son), electrical engineer and wireless dealer, 227, Stockport Road, Ashton-under-Lyne.—Trustee, Mr. R. K. Clark, Byrom Street, Manchester, Official Receiver, released September 13th.

L. Holzman, manufacturer of wireless electrical equipment, 1, Robert Street, Hampstead Road, N.—Receiving order made October 9th on a creditor's petition. Public examination December 13th, at Bankruptcy Buildings, Carey Street, W.C.

H. W. Titmarsh, electrical engineer and wireless dealer, 23, Wisbech Road, Littleport.—Trustee, Mr. J. L. Wilkinson, 41, Sidney Street, Cambridge, Official Receiver, released October 9th.

J. Robertson, electrical engineer, 68, Arran Road, Catford, S.E.—Receiving order made October 8th on a creditor's petition. First meeting, November 1st, at 29, Russell Square, W.C. Public examination, November 27th, at the Court House, Greenwich.

L. C. Merrison, radio and electrical engineer, Radio House, High Street, Bushey.—Receiving order made October 13th on debtor's own petition.

V. O. Godolphin, electrical engineer, 8, The Leaze, Burford.—First meeting, October 26th, at 8, Forbury, Reading. Public examination, November 19th, at the County Hall, Oxford.

R. H. Chambers (R. H. Chambers & Co.), electrical engineer, Market Street, Dartford.—Trustee, Mr. E. H. Hawkins, 4, Charterhouse Square, E.C., released September 28th.

L. E. Pearce (St. John's Electrical Co.), electrical engineer, 48, St. John's Road, Tunbridge Wells.—First dividend of 1s. 6d. in the £, payable October 30th, at 6-7, Old Steine, Brighton.

Company Liquidation

Lang & Squire, Ltd.—Winding-up voluntarily. Liquidator, Mr. H. Gimson, Effingham House, Arundel Street, W.C.

Electricity Supply

Lighting, Domestic, Power

Australia.—NEW PLANT.—A start has been made on the installation of an additional 25,000-kW generating set at the Yallourn power station of the Victoria Electricity Commission. The Commission is inviting tenders for the supply of new coal-handling plant of the belt-conveyor type.

Bexhill.—CHANGE-OVER.—The Electricity Committee has obtained sanction to borrow £1,997 in connection with the change-over of supply at Beaulieu Road and Cooden Drive West.

Blackpool.—EXTENSION.—The Electricity Committee has decided to extend cables from Singleton for 1½ miles towards Wesham.

Bolton.—INCREASED DISCOUNT.—The Electricity Committee has decided to raise the discount allowable on accounts from 2½ per cent. to 5 per cent. The concession will cost the department about £3,000 a year.

Bradford.—THE PAST YEAR'S WORK.—The sales of electricity in Bradford for the year ended March 31st last amounted to 118 million kWh, an increase of over six million on the previous year, which would have been doubled (and so provided the greatest increase yet recorded) but for the cessation of the temporary bulk supply to Keighley. Industrial power was up by eight million kWh and domestic supplies by nearly two million kWh. Mr. T. Roles, the city electrical engineer, reports that the gross revenue increased by £8,500 to £573,000, and would have been £130,000 greater but for the reduction in charges made in July, 1932. The gross profit was £164,000. The m.d. on the Valley Road power station was 72,200 kW, 25,000 kW of which was required by the Central Electricity Board, to which 9½ million kWh was sold and from which 37 million kWh was received. The high-pressure steam plant fulfilled the makers' guarantees on the tests of last October and remained in commission until April, when the construction of the upper part of the economiser was modified and the superheater was replaced by Messrs. Babcock & Wilcox with one of different design. During the year the plant has run for 1,629 hours, and has provided steam for generating 14½ million kWh. Consumers' services were laid to 4,105 premises during the twelve months—1,148 in excess of the number in 1932-33. Change-over from d.c. to a.c. affected 447 consumers with a connected load of 403 kW. The total number of consumers at the end of last March was 46,621 with an aggregate connected load of 182,000 kW—an increase of 12,000 kW, of which power accounted for about 1,800 kW. Domestic consumers accounted for 3,479 out of the 3,727 new connections.

Bridport.—NEW PLANT.—A new 430-kW set was to be formally inaugurated at the power station, North Allington, by the Mayor of Bridport yesterday (Thursday).

Bromley.—SUB-STATION.—The Electricity Committee is to erect a sub-station in Rangefield Road, Downham.

Clitheroe.—LOAN.—The Electricity Committee is making application for sanction to borrow £1,520 for overhead and underground mains, transformers and switchgear.

Colchester.—REDUCED CHARGES.—The Council has adopted a reduced scale of charges. In the city the new lighting flat rate is 5½d. per kWh, and in the extended area 7½d. The kW demand rate is £3 15s. per kW per annum and 0.50d./0.40d. per kWh, with an addition of 15 per cent. in each case in the extended area. The lighting demand rate for users of large amounts is £12 per annum per kW installed and a "unit" charge of 1d., plus 15 per cent. in each case in the extended area. An all-the-year rate of ⅜d. per kWh is now available for water and space heating off-peak, and the home service meter rent is reduced to 1s. per quarter.

NEW FEEDER PILLARS.—The Council has decided to replace fifteen of the existing feeder and distributing pillars in the borough, some of which have been in service for at least twenty years, by pillars of modern design, the estimated cost being £1,100.

Wardle "Solux" street lanterns, designed for use with Philips sodium lamps, installed in Davyhulme Road, Stretford. The choke coil is housed in the dome of the lantern, the only external apparatus being the power factor condenser; 90-W lamps are used

Crewe.—PROPOSED REDUCED CHARGES.—The Town Council is considering a recommendation to reduce the electricity charges from 4d. per kWh for lighting and 1d. for power to a ¾d. per kWh running charge, plus an annual charge of 14s. per room where lights are installed, excluding bathrooms, kitchens, and hall passages.

Dover.—LOAN.—The Electricity Commissioners have sanctioned the borrowing of £2,000 for mains.

Dumfries.—NEW EQUIPMENT.—The installation of an additional h.v. oil switch at the Leafield Road Station, switch and transformer kiosks at Dumfries Infirmary, and Loganbarns, together with cable laying, has been approved by the Town Council at a cost of £2,332.

Ealing.—WATER-HEATING CHARGES.—The Electricity Committee has fixed the following charges for water heating: Low wattage heating under 1 kW per consumer on a constant load of twenty-four hours throughout the year, 0.675d. per kWh. Storage-type heating, up to 3 kW in use at one time per consumer, 1d. per kWh. Off-peak load storage-type heating, up to 3 kW in use at one time per consumer, ¾d. per kWh; restricted hours, 4 p.m. to 9 a.m., October to February. Unrestricted supply for heating, up to 4 kW capacity in use at one time per consumer, £1 per kVA of the capacity of the heating installation in use at one time (quarterly), plus ¾d. per kWh. Heating on circuit between 10.30 p.m. and 6.30 a.m., up to a capacity of 3 kW in use at one time per consumer, ¾d. per kWh.

Exeter.—LOAN.—The Electricity Committee is to borrow £10,000 for domestic hire apparatus, and is seeking sanction to borrow £5,000 for house-wiring installations and £5,000 for sub-station equipment.

Inverness.—INQUIRY.—An inquiry was held recently by Mr. Henry Nimmo, chief engineering inspector of the Electricity Commissioners, regarding an application by the Corporation for power to install a 2,000-kW turbo-alternator set at the generating station to meet the growing demand. It was stated that in 1926 there were 927 consumers, and in September of this year 3,332, an increase of 234 per cent. Mr. R. P. Morison objected on behalf of the Grampian Electricity Supply Co., Ltd., who, he said, had offered terms of bulk supply to the town. Mr. H. D. Partington, general manager of the Grampian Co., stated that within six months they were proposing to connect all their lines in the north with those in the south, so that under bulk supply Inverness would be assured of continuity. Mr. G. C. Maclean, burgh electrical engineer and manager, expressed the view that local generation would be more satisfactory than bulk supply.

Lancashire.—REDUCED CHARGES.—A reduction from 6d. per kWh to 5d. is to be made by the Lancashire Electric Power Co. next year in the lighting flat rate in various areas, including Burscough, Parbold, Leigh, Skelmersdale, Adlington, Chorley, &c.

Liverpool.—IMPROVEMENT IN OUTPUT.—Mr. P. J. Robinson, the city electrical engineer, stated, at the inspection luncheon of the Electric Power and Lighting Committee last week, that during the years of depression the Corporation electric supply had never shown a lower increase than 5 per cent., and now, in less than six months, the increase was over 14 per cent. on last year. This was largely due to industrial expansion. A new department was being set up for electro-plating and for the repair of electric cookers.

London.—ISLINGTON.—The Electricity Committee is seeking sanction to borrow £10,000 for mains.

SOUTHWARK.—The Electricity Committee recommends that the borough electrical engineer be empowered to carry out further free-wiring installations in approved premises (£1,300).

HAMMERSMITH.—The consumers of the Hammersmith Borough Council will benefit by £27,500 per annum from the following new tariffs:—Flat rates for ordinary lighting and small power, 2¾d. and 0.9d. per kWh respectively, and for prepayment consumers 3d. per kWh; domestic tariff 7½ per cent. of the rateable value plus ½d. per kWh (instead of ¾d); water heating and other approved long-hour loads 0.3d.; business premises (including signs and outside lighting) £10 per kW of installed lighting capacity plus ½d. per kWh; street-lighting 0.65d. per kWh. The charges for the assisted-wiring will be 10 per cent. lower.

DEVELOPMENTS.—Large blocks of flats such at Latymer Court and King's Court are nearing completion, and the Council has co-operated with the owners to provide for a complete electrical equipment. Of the flats let at Latymer Court 70 per cent. have adopted electric cooking, as well as electrical refrigerators, fires, and other appliances. The Department sold

53.6 million kWh for the year ended March 31st, 1934, an increase of 5 million kWh over the previous year.

Lossiemouth.—REDUCED CHARGE.—The Town Council has reduced the charge for electricity for lighting purposes by ½d. per kWh to 7d.

Manchester.—MONTHLY PROGRESS.—The monthly report shows that there were, during August, 1,577 (1,413) new consumers, 759 (804) applications for additional supplies, bringing the total to 2,336, representing 4,806 kW. The figures in parentheses are for July. Orders received for cookers amounted to 228, and for wash-boilers to twenty, the total on circuit being 13,533 and 701 respectively. There are now 609 water heaters, sixty-three orders having been received during August.

Mountain Ash (Glam).—A FORTUNATE POSITION.—The Urban District Council claims that its lighting rate is the lowest in Great Britain. A statement to that effect is contained in the annual report of the Council's electricity undertaking, which shows that during the quarter ended December 31st, 1933, a bonus discount of 1d. per kWh was granted, bringing down the lighting rate to only 1½d. per kWh. The undertaking yielded a profit last year of £4,330, as compared with £6,314 in the previous twelve months. During the year ended March 31st last the amount of electricity sold showed an aggregate increase of 9.4 per cent. over the previous year. All loans raised for the purpose of developing the undertaking have been repaid, and there are, therefore, no capital charges to be met.

Northants.—NEW SUPPLIES.—The Northampton Electric Light & Power Co., Ltd., is to provide a supply of electricity to Milton Keynes, Broughton, Moulsoe, and North Crawley.

Norwich.—SUPPLY EXTENSION.—It is proposed to supply electricity to Spixworth and Haynford.

Portland.—NEW TARIFF.—The Electricity Committee has decided to adopt the following tariff: Fixed charge based on 0.5 W per sq. ft. of premises at £13 10s. per kW per annum, plus a "unit" charge of 2d. per kWh.

Pulborough.—OVERHEAD LINES.—The Steyning Electric Light Co. has obtained consent to the erection of overhead lines for a supply to the Codmore Hill district.

Rawtenstall.—LOANS.—The Electricity Committee has decided to apply to the Commissioners for sanction to a loan of £20,000 for laying electricity cables and £10,000 for electricity services.

Rugby.—STREET LIGHTING.—The latest installation of "Mazda Mercra" lamps has been officially switched on at Rugby, the home of the "Mazda" lamp. New standards have been erected along Clifton Road, Whitehall Road, and part of Church Street. The equipment consists of forty "Diron" lanterns, each fitted with a 400-W "Mercra" lamp.

New "Mazda Mercra" street lighting at Rugby

The lanterns are mounted at a height of 25 ft. and are spaced 150 ft. apart in staggered formation, except at curves, where they are placed on the outside of the curve. Five of the lanterns are centrally suspended in order to avoid large trees. The installation corresponds in detail with British Standard Specification 307/1931, class "D" illumination. Auxiliary lighting has been provided by means of 150-W "Mazda" gasfilled lamps mounted 15 ft. high and supplied from an independent cable. The switching of both types of lamp is automatic.

Spalding.—UNDERTAKING NOT FOR SALE.—A number of offers have been received for the purchase of the Urban District Council's electricity undertaking, among them being those of the Mid-Lincolnshire Electricity Supply Co., Ltd., and the London & Midland Investment Co., Ltd. It has been decided to inform all inquirers that the undertaking is not for sale.

Sweden.—ELECTRIFICATION.—Another stage in the conversion of all the main lines of the Swedish State Railways has been completed by the opening to electric traction of the Orebro-Krylbo line at the beginning of the present month. Nine months ago the Riksdag granted a Budget allowance of 11,150,000 kr. for the completion of conversion work on this 70-mile division.

Taunton.—CONCESSIONS.—The Electricity Department is to reduce the charge for electricity through prepayment meters by ½d. per kWh. A new maximum demand rate for electricity consumed for non-domestic purposes is being introduced experimentally. Flat-rate consumers, if they desire, can be charged £3 10s. per kW of maximum demand per quarter, plus 1d. per kWh consumed. Power consumers are to be allowed a rebate of 25 per cent. off existing charges during the two winter quarters, provided they agree not to operate motors between 4 and 6.30 p.m. on Mondays, Tuesdays, Wednesdays and Fridays during November, December and January. Commenting on the maximum demand charge Councillor Barker stated at a recent Town Council meeting that they hoped to be able to reduce the "unit" charge to ½d. by this time next year.

Thornton Cleveleys.—LOAN.—The Council has decided to apply to the Electricity Commissioners for sanction to borrow £10,000 for mains and services and £2,000 for meters.

Turkey.—HYDRO-ELECTRIC POWER.—Representatives of the Ministry for Economic Affairs are reported to have arrived at Adalia, where they are to investigate the hydro-electric resources.

Tynemouth.—REDUCED CHARGES.—The Electricity Committee has reduced charges from 4d. to 3¾d. per kWh.

Warrington.—STATHAM.—Cables are to be laid at Peel Lane, Statham.

Westbourne (Hants).—PUBLIC LIGHTING INAUGURATED.—The new electric street lighting was inaugurated recently.

Weybridge.—PROPOSED ACQUISITION OF UNDERTAKING.—A Special Committee is to be appointed by the Urban District Council to discuss with the London and Home Counties Joint Electricity Authority and any other interested bodies the acquisition by the Council of the portion of the Authority's undertaking serving the Weybridge area.

Wigton.—OVERHEAD LINES APPROVED.—The Rural District Council has agreed to proposals submitted by the Mid-Cumberland Electricity Co., Ltd., for the erection of overhead lines from Prospect to Allonby.

Winchester.—ELECTRIC CONTROL FOR COACHING STATIONS.—At the new motor coaching station built by the Corporation, arrivals and departures are controlled from a special watch tower by means of an electrically operated indicator, and the timings are regulated by electric clocks. One main switch controls the whole of the lighting, with three separate switches for the "stop" and "arrow" signals. Single numbers 0 to 9 are operated by a simple slide movement and "tens" and "twenties" by link switches. The indicator, which is of special G.E.C. design, is double-sided, with arrows indicating the numbered bay or pen which coaches are to occupy while waiting in the semi-circular space surrounding the station and control tower. The luminous signals are so constructed that they are as clear in bright sunshine as they are after dark. The space around the tower is illuminated by a number of "Osira" lamps housed in G.E.C. "Rochdale" lanterns mounted on tall columns. The station, which cost £8,000 to build, has met with the approval of the Ministry of Transport, and a second station is to be erected at Winchester, as well as one at Southampton.

Traction

Australia.—OFFER FOR TRAMWAYS REFUSED.—At a meeting of the New South Wales Cabinet it was decided to refuse an offer to purchase the Sydney and Newcastle Tramway systems for £5 million. The bid had been made on behalf of a Sydney syndicate. The Premier said that the tramway undertaking was in a healthy financial condition, and was making provision for renewals and depreciation. It represented a capital investment of £8 million, exclusive of the power house equipment, which had been installed largely for the use of the tramways.

France.—THE PARIS METRO.—Noise reduction has been a prime consideration in the reconstruction of a number of the sub-stations of the Cie du Chemin de Fer Metropolitain de Paris (the underground railway). A noiseless converter is being studied, but a more immediate solution of the problem has been found in the use of large capacity mercury vapour rectifiers. The first test installation of this kind in Paris is almost ten years old. During the last two years a number of sub-stations have been entirely rebuilt, one of the most recent being at Auteuil, where four rectifiers of a total capacity of 6,000 kW have been installed. The station has a double feed at 10,000 V, three-phase, from two different generating plants, one at Saint Denis and the other at Ivry. Each rectifier is fed from a separate cable. Three rectifiers operate normally, the fourth being an emergency set. As protection from fire fusible links above the various pieces of plant indicate when the temperature has risen to a dangerous point, at the same time starting up a carbon dioxide generator, and ringing a bell, a luminous signal showing which machine is out of order so that the attendant can turn on the tap liberating the carbon dioxide. For lighting and signal circuits there are two small d.c. generators which feed an 800 Ah battery situated at the top of the building. Pictures appear on the next page.

ELECTRIC VEHICLES.—At the recent motor show in Paris the only electric goods transport vehicles were three-ton and five-ton lorries made by the Société Sovel. These vehicles had batteries slung at each side of the frames, and the controllers,

located under the driver's seat, gave five speeds, both forward and reverse. The larger model was chain-driven from two motors suspended at the rear of the frame, while the other had a single motor bolted at one end to the centre casing of the rear axle and suspended at the other end by a coil compression spring.

India.—Railway Electrification.—There has been little progress in railway electrification in India during the past few years of trade depression, but as conditions are now becoming more favourable it is likely that further extensions will be undertaken. Financial results of the electrification of certain sections of the Great Indian Peninsula Railway are now available, and in a review of these statistics, *Modern Transport* states that if the percentage of the net savings were calculated not on the gross outlay, but on the net outlay (*i.e.*, after making an allowance for the extra outlay on steam stock if no electrification had taken place, and for the cost of steam-hauled stock released for other purposes on the system) the return is improved to 4.08 per cent. in 1930-31 and 5.37 per cent. in 1931-32. Such figures are not only of sufficient magnitude to justify the electrification of the system, but also give promise of an increasingly better return with a recovery in the general conditions of trade and traffic.

Italy.—Main Line Conversion.—The main line from Naples to Calabria is to be opened to electric traction as far as Salerno (33 miles) on October 28th, and will form the first d.c. portion of the 4,200,000-lire electrification scheme announced by the Minister of Communications in 1933. The line will be fed at a pressure of 3,000 V from three rectifier sub-stations, two of which are existing stations at Naples.

Japan.—Electrified Main Line.—The 4¼-mile Tanna tunnel on the Japanese Government Railways is now finished, and test trips are being made with electrically hauled trains. Regular traffic will commence on December 1st, and from the beginning of 1935 the main expresses from Tokyo to Kobe will go through the tunnel and will be worked by electric locomotives from Tokyo to Numazu, a distance of 90 miles.

Railways and Tramways.—Returns of the Railway Department at the end of July, 1934, for the local railways and tramways show that the mileage of the different systems was as follows: Electric, 2,427 km.; "steam-gasoline," 2,425 km.; "steam-electric," 1,307 km.; steam, 827 km.

Traffic Signals.—The Roads Committee of the Hereford Corporation recommends the installation of signals at Haford and Ledbury Roads, Ross and Abergavenny Roads, High Town and Widemarsh Street, and High Street and Broad Street. The London County Council has decided to install illuminated traffic signs at the Blackwall Tunnel (£1,000).

Automatic signals costing £600 are proposed for Valence Avenue-Green Lane junction, Dagenham.

The erection of signals at three crossings is proposed at Gillingham.

The Liverpool Tramways Committee claims that the installation of automatic signals without regard to tramway stopping places in the town is causing inconvenience and confusion amongst the travelling public, and that the efficient working of the penny stage system is endangered. The committee has decided to invite the Watch Committee to confer with it before proceeding with the installation of any further traffic signals.

The erection of traffic signals at the Arches at the junction of Armitage and Brereton Roads is proposed by Rugeley Highways and Town-planning Committee.

Signals are to be erected on the Bristol-Weston-super-Mare main road.

The Bournemouth Roads Committee recommends the installation of automatic signals at the following junctions:—Alumhurst and Alum Chine Roads; Holdenhurst and Richmond Park Roads; and Christchurch and Parkwood Roads.

The installation of traffic signals is proposed at several road junctions at Salisbury.

Warwickshire County Council are to erect traffic signals in Stratford-on-Avon at the junctions of Alcester Road with Arden Street, and Grove Road with Greenhill Street.

Coulsdon and Purley Urban District Council is to consider a suggestion by the Ministry of Transport that automatic traffic signals be installed at Purley cross roads (£1,640).

The Newcastle-on-Tyne Watch Committee recommends the installation of a "flexible progressive" system of controls on the Great North Road between Grandstand Road and Barrasford Bridge.

Chester Corporation is to consider the installation of automatic signals at the junction of Liverpool Road, Parkgate Road, and Chichester Street.

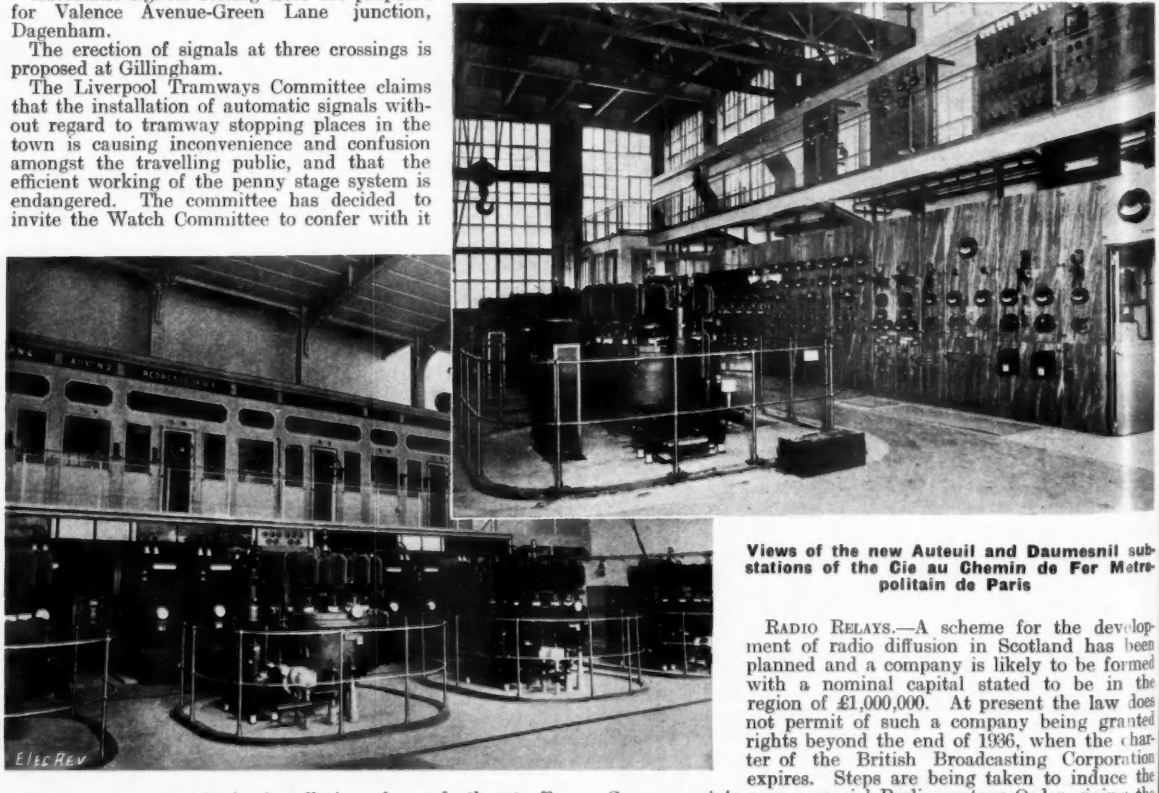
Communications

Argentina.—Radio Station Closed.—According to *Telegraph & Telephone Age*, the Argentine Government recently closed the Standard Oil Company's wireless station at Tartagal, in Salta Province, near the Bolivian frontier, on the charge of "suspicious activities" in the Chaco war, which threatened Argentine neutrality. A fine of 1,000 pesos was imposed.

Denmark.—Radio Railway Signalling.—The Danish State Railways have begun experiments with wireless to replace the usual telegraph communication between stations for signalling purposes. Tests are being carried out on the Slagels-Kalundborg lines says the *Wireless World*.

European Telephone Service.—Speed-up Urged.—A meeting of the Committee of International Telephone Service of the International Chamber of Commerce was held in Paris last week, under the chairmanship of Mr. J. S. Edstrom, chairman of the Swedish General Electric Company. It discussed the improvement of the personal call system by bringing it more closely into line with the American person-to-person call, and the possibility of a further speeding up of European service. The average speed of connection in Europe had already been reduced to the neighbourhood of ten minutes, but it was felt that there was much to be done before the ideal of an international no-delay service was reached.—*Financial Times.*

Great Britain.—Wireless Licences.—Approximately 428,812 wireless receiving licences were issued during September, a net increase of 43,980, and the number in force at the end of the month was 6,472,945.



Views of the new Auteuil and Daumesnil substations of the Cie au Chemin de Fer Metropolitain de Paris

Radio Relays.—A scheme for the development of radio diffusion in Scotland has been planned and a company is likely to be formed with a nominal capital stated to be in the region of £1,000,000. At present the law does not permit of such a company being granted rights beyond the end of 1936, when the charter of the British Broadcasting Corporation expires. Steps are being taken to induce the Government to pass a special Parliamentary Order giving the company privileges over a more extended period. The scheme suggests that Scotland may soon have a number of powerful receiving and redistribution stations.

According to a report the programmes would be provided through the ordinary electric supply lines, and the system would be worked on the "carrier" telephony, or "high frequency" principle, which permits six programmes to be relayed on a single electric mains line without interfering with the normal function of the mains.

Contract Information

When "Contracts Open" are advertised in our "Official Notice" pages the date of the "Electrical Review" containing the advertisement is given in parentheses below

Contracts Open

Argentina.—BUENOS AIRES.—Ministry of Public Works. November 30th. Hydro-electric plant. (A.Y. 12704.)*

Armagh.—November 15th. Education Committee. Electric lighting and central l.p. hot-water system at the P.E. school, Lurgan. Specifications from J. St. J. Phillips, 16, Donegall Square South, Belfast (deposit £2 2s. each contract); tenders to the architect, Education Office.

Australia. — MELBOURNE. — November 29th. Metropolitan Tramways Board. P.i. l.c. cable. (A.Y. 12629.)* Traction sub-station units. (A.Y. 12623.)*

State Electricity Commission of Victoria. December 10th. Oil-insulated transformers. (A.Y. 12719.)* 6,600-V compound-filled circuit-breaker unit and accessories. (A.Y. 12700.)*

Posts and Telegraphs Department. December 18th. Automatic telephone switching equipment. (A.Y. 12663.)*

November 27th. Telephone switchboard indicators of various types. (A.Y. 12679.)* Telephone jacks and number plates. (A.Y. 12710.)*

December 11th. Telephone switchboard keys of various types and accessories. (A.Y.12712.)* Resistance and reactance spools and coils. (A.Y. 12709.)*

SYDNEY.—December 3rd. New South Wales Public Works Department. Hydro-electric plant in connection with the Burrinjuck water power development scheme. (A.Y. 12617.)*

Municipal Council. December 17th. 33,000-V and 11,000-V switchgear. (A.Y. 12703.)*

Brighton.—November 6th. Corporation. Complete electrical installation at the Municipal Airport. (October 12th.)

Bristol.—November 2nd. Electricity Department. Four steam raising units. (October 19th.)

Conway.—October 31st. Electricity Department. H.p. and l.p. cables. (October 19th.)

Darton.—November 3rd. Lighting installation at new senior school. Particulars from education officer, County Hall, Wakefield.

Egypt.—CAIRO.—Ministry of Public Works. November 15th. Mechanical and Electrical Department. Power house equipment at Gordon's Tree Dockyard. (G.Y. 14291.)*

Ministry of the Interior. November 17th. Material in connection with the overhead and underground networks at Chebin-el-Kanater. (A.Y. 12626.)*

KHARTOUM.—December 13th. Public Works. Ministry in the Sudan. Electrical wiring materials for workshops at Gordon's Tree Dockyard. (A.Y. 12706.)*

Grimsby.—November 9th. Electricity Department. L.p. cables. (See this issue.)

Hastings.—November 29th. Electricity Department. Materials for the year commencing January 1st, 1935. (See this issue.)

India.—NEW DELHI.—November 26th. Stores Department. Flameproof v.i.r. cable. (A.Y. 12717.)*

Kilkenny.—November 17th. Commissioner of the District Mental Hospital. Electrical installation and subsidiary services at the hospital. Specifications from J. P. Tierney & Co., 44, Kildare Street, Dublin (deposit £5 5s.); tenders to P. J. Cassin, resident medical superintendent, District Mental Hospital.

Lincoln.—November 7th. Electricity Department. Three 6,600/400/230-V, 3-phase, oil-immersed transformers. (See this issue.)

London.—SOUTHWARK.—November 2nd. Borough Council. Cables for twelve months ending November 30th, 1935. (October 19th.)

Manchester.—October 31st. Electricity Department. Electric goods lift at the Polygon Depot, Ardwick. Specifications, &c., from H. C. Lamb, chief engineer and manager, Electricity Department, Town Hall; tenders to the chairman of the Electricity Committee, Town Hall (deposit £1 1s.).

New Zealand.—WELLINGTON.—Posts and Telegraphs Department. December 5th. 200 lead-acid secondary cells. (A.Y. 12687.)*

CHRISTCHURCH.—Electricity Department. January 15th. Metal-clad switchgear. (A.Y. 12723.)*

Northampton.—November 10th. Transport Committee. 365 to 400-V, 3-phase, 50-cycle motors. (See this issue.)

Romford.—October 26th. U.D.C. Electric lighting installation in forty houses and twelve flats on the Rush Green Estate. Particulars from engineer and surveyor, 110, Market Place.

Sleaford.—October 29th. Electricity Department. E.h.p. underground feeder, sub-station kiosk, switching and transformer, l.p. mains and distribution equipment. (October 12th.)

South Africa.—PORT ELIZABETH.—November 22nd. Municipality. Steam turbo-generator. (A.Y. 12678.)*

CAPE TOWN.—November 21st. Electricity Department. P.i., impregnated lead-sheathed, steel tape armoured cables. (A.Y. 12701.)*

PRETORIA.—November 23rd. Union Tender and Supplies Board. Linesmen's detectors. (A.Y. 12721.)*

JOHANNESBURG.—November 23rd. Railways and Harbours Administration. Motor-driven plate-splitting and punching machine with bar angle and tee bevel cropper. (A.Y. 12714.)*

Swansea.—November 8th. Electricity Department. One 10,000-kW turbo-alternator and accessories. (October 12th.)

Uruguay.—MONTEVIDEO.—November 26th. Supply and Telephones Administration. Metal filament lamps. (A.Y. 12670.)*

Walsall.—November 13th. Electricity Department. Electrical material, &c., for one year from January 1st, 1935. (See this issue.)

Watford.—November 5th. Electricity Department. Water-cooling tower. (October 19th.)

Wimbledon.—November 12th. Electricity Department. One 100-kW and alternatively one 200-kW direct-coupled, single-phase, 50-cycle, 2,000-V Diesel-generator. Specifications from chief engineer and manager, Corporation Electricity Works, Durnsford Road.

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* Further particulars can be obtained at the Department of Overseas Trade (Inquiry Room), 35, Old Queen Street, S.W.1.

Contracts Closed

Birkenhead.—Electricity Committee. Accepted. Transformer kiosks (schedule prices).—Crompton Parkinson, Ltd. Installations under assisted wiring scheme.—L. W. Bryan; Economic Electric Co. and Park Electric Co.

Chichester.—City Council. Accepted. Wittering electricity extension scheme (£30,182).—Overhead, Ltd.

Deptford.—Town Council. Accepted. Traffic control signals (£808).—Automatic Electric Co., Ltd.

Desborough.—U.D.C. Accepted. Electric pumps for the new water supply at Pipewell.—Worthington-Simpson, Ltd.

East Ham.—Electricity Committee. Recommended. Cables.—Liverpool Electric Cable Co., Ltd.; Enfield Cable Works, Ltd. One 500-kVA transformer.—English Electric Co., Ltd. Ring tapping switchgear unit.—Crompton Parkinson, Ltd.

Government Contracts.—The following contracts were placed by the various Government Departments during September:—

ADMIRALTY (CONTRACT AND PURCHASE DEPARTMENT).

Battery containers.—I.R.G.P. & Teleg. Works Co.

Water tube boilers.—Yarrow & Co. Sub-contractors: International Combustion, Ltd., for mechanical stokers; E. Green & Sons for economisers; Davidson & Co. for fans; J. Gordon & Co. for reducing and desuperheating plant; G. & J. Weir for feed pump; Lancashire Dynamo & Crypto for motors; Allen West & Co. for control gear.

Electrical equipment for boring and turning mill.—Lancashire Dynamo & Crypto.

Boxes, switches, &c.—Engg. & Lighting Equipment Co.; Whipp & Bourne; G.E.C.; L. Weekes (Luton); W. McGeoch & Co.

Submarine, p.i. cable, &c.—Siemens Bros.

Inert cells.—Fuller Accumulator Co. (1926).

Electrical equipment for compressing plant.—Met.-Vick. Elecl. Co.

Compressors.—Peter Brotherhood. Sub-contractors: Crompton Parkinson for motors; Allen West & Co. for control gear.

Seaplane crane.—Babcock & Wilcox. Sub-contractors: Veritys for motors; Allen West & Co. for control gear.

Electric hot-cupboards.—Simplex Electric Co.

Fuseholders.—Bertram Thomas.

L.p. junction boxes.—G.E.C.

Mercury arc rectifier.—Hewittic Electric Co.

Switchboards.—Whipp & Bourne.

Motors for v.s.g. units.—Met.-Vick Elecl. Co.

Wireless valves.—G.E.C.; Mullard Radio Valve Co.; Ediswan.

Welding motor generators.—Laurence, Scott & Electromotors.

WAR OFFICE.

Primary battery boxes.—H. W. Sullivan.

Electric cable.—B.I. Cables; Teleg. Construction & Maintenance Co.

Telephone cable.—Siemens Bros.

Electric travelling crane.—H. Morris.

Generating sets.—R. A. Lister & Co.; Ruston & Hornsby.

AIR MINISTRY.

Accumulators.—Oldham & Son.

Condensers.—Muirhead & Co.

Fire alarm apparatus.—W. Geipel.

Generators and accessories.—B.T.H. Co.; Haslam & Newton; G. E. Mortley Sprague.

Navigation lamps.—Johnson & Phillips; Telford, Grier & Mackay.

Switches.—Phœnix Telephone & Elect. Works.

Transmitter and wavemeters.—Marconi's.

POST OFFICE.

Telephonic apparatus.—Automatic Elec. Co.; Brecknell, Munro & Rogers; Ericsson Telephones; G.E.C.; B. W. Johnson & Sons; Plessey Co.; Siemens Bros.; Standard Telephones; Telephone Mfg. Co.

Testing and protective apparatus.—W. Jones & Co.; Phœnix Telephone & Elect. Works; Telephone Mfg. Co.

Cable.—B.I. Cables; Connollys; Enfield Cable Works; G.E.C.; Hackbridge Cable Co.; Henley's; Macintosh Cable Co.; Siemens Bros.; Standard Telephones; Teleg. Construction & Maintenance Co.

Loading coils.—Automatic Electric Co.; G.E.C.

Compound.—Dussek Bros.

Telephone cords.—B.I. Cables; London Elec. Wire Co. & Smiths; L.P.S. Elecl. Co.; Reliance Elecl. Wire Co.; Siemens Bros.

Insulators.—Bullers.

Recoating of cases with ebonite.—I.R.G.P. & Teleg. Works; Siemens Elec. Lamps & Supplies.

Rectifiers.—Ediswan.

Garage electric washing plants.—R. Cadisch & Sons.

Armoured cable.—Ellon-Peterhead: G. Wimpey & Co.

Cabling.—Ellon-Peterhead, Elgin-Inverness: United Telephone Cables. Colwyn Bay-Bangor-Caernarvon: Siemens Bros.

Cabling, loading coils and terminations.—Belfast-Ballymena: United Telephone Cables. Liverpool-Glasgow and the overall transmission testing and lining-up of the Liverpool-Glasgow carrier circuits: Standard Telephones. Carlisle-Newcastle-on-Tyne: Siemens Bros.

Telephone exchange equipment.—Cheltenham; Arnold;

Rugby: Automatic Electric Co. Liberty (London); Kettering; Bloxwich: Ericsson Telephones. Great Yarmouth: Siemens Bros. Hop (London); London trunk exchange: Standard Telephones.

Exchange fitting by contractor.—South-Western district: Automatic Elect. Co.

Telephonic repeater equipment.—Bristol: G.E.C. Preston: Standard Telephones.

Telephone repeater equipment (power plant).—Whitchurch: Austinlite. Sub-contractors: D.P. Battery Co. for batteries; Crompton Parkinson for generators; Morton & Weaver for oil engine.

Voice frequency telegraph equipment.—London; Belfast: Standard Telephones.

H.M. Office of Works.

H.p. and l.p. switchgear transformer and l.p. cables.—Geological & Science Museums: Crompton Parkinson.

Electric passenger lift.—Somerset House: Newbury & Thomas.

Crown Agents for the Colonies.

Boiler equipment.—Babcock & Wilcox.

Electric derrick cranes.—Anderson-Grice Co.

Dry core cable, &c.—B.I. Cables.

Engine generator, &c.—R. A. Lister & Co.

Private automatic exchange and spares.—International Automatic Telephone Co.

Switchgear, &c.—Met.-Vick. Elecl. Co.

Transmitter.—International Marine Radio Co.

X-ray apparatus.—Schall & Son.

London.—Stoke Newington.—Electricity Committee. Recommended. E.h.p. and pilot cables for the sub-station in Victoria Road (£476).—W. T. Henley's Telegraph Works Co., Ltd.

Bermondsey.—Electricity Committee. Recommended. One-panel switch (£140).—A. Reyrolle & Co., Ltd. 300-kVA transformer (£185).—British Electric Transformer Co., Ltd. E.h.p. cable (£218) and e.h.p. joints (£55).—Pirelli-General Cable Works, Ltd.

Fulham.—Electricity Committee. Recommended. Re-wiring the Town Hall (£431).—Springvale Electrical Co. Electrical fittings (£647).—Edison Swan Electric Co., Ltd.

St. Pancras.—Contracts and Stores Committee. Recommended. Electrical installations at 134 flats (£652).—W. G. Bailey. This was the lowest of ten tenders, the highest being £800.

Stepney.—Electricity Supply Committee. Recommended. 250 wash-boilers (£2 5s. each).—Revo Electric Co., Ltd. 500 prepayment meters.—Ferranti, Ltd.

Liverpool.—Hospitals Committee. Recommended. 100-kW engine and generator (£1,050).—W. H. Allen, Sons, & Co., Ltd.

Smethwick.—Watch Committee. Accepted. Traffic signals at Cape Hill (£791).—Automatic Electric Co., Ltd.

South Africa.—Cape Town.—Electricity Committee. Recommended. Cables (£54,905) and joint boxes (£4,475).—Siemens Bros. & Co. (British), Ltd. Ranges.—S.A. General Electric Co., Ltd. (£811); T. Barlow & Sons, Ltd. (£248); British General Electric Co., Ltd. (£264). Switchgear (£7,583).—A. Reyrolle & Co., Ltd. Insulators, galvanised cross-arms, straps, spindles, &c. (£1,469).—British Insulated Cables (S.A.), Ltd. Street lighting fittings.—Davis & Soper, Ltd. (£497); Stewarts & Lloyds (S.A.), Ltd. (£1,495).

Weymouth.—Town Council. Accepted. 750-kVA transformer (£260) and l.p. switchboard (£129).—English Electric Co., Ltd. Service cable for the supply to the Whitehead Torpedo Works (£213).—Johnson & Phillips, Ltd.

Wrexham.—R.D.C. Accepted. Installing electric lighting at 154 houses (£715).—E. N. Jones.

Forthcoming Events

Institution of Electrical Engineers.—Monday, October 29th. Institution, London. 7 p.m. Informal meeting. Discussion on "First Principles." (*North Midland Students' Section*).—Saturday, October 27th. 2.30 p.m. Visit to the Thornhill power station of the Yorkshire Electric Power Co. Tuesday, October 30th. Hotel Metropole, Leeds. 7.15 p.m. Address by Mr. J. Hearn. "Mass Production." (*North-Western Students' Section*). Saturday, October 27th. Grand Hotel, Manchester. 6.30 p.m. Annual dance. Tuesday, October 30th. Engineers' Club, Manchester. 7.15 p.m. "The Single-Phase Capacitor Motor." Mr. M. Whitehead. (*Meter and Instrument Section*).—Friday, November 2nd. Institution, London. 7 p.m. Address by Prof. J. T. MacGregor-Morris. (*North-Eastern Students' Section*).—Friday, November 2nd. Armstrong College, Newcastle-on-Tyne. 7.15 p.m. "Public Lighting by Electricity." Mr. J. A. Prowse.

Birmingham Electric Club.—Friday, October 26th. Grand Hotel, Birmingham. 7 p.m. "Traffic Control Signals." Mr. F. G. Tyack.

Electrical Association for Women.—Friday, October 26th. 20, Regent Street, S.W.1. 3 p.m. Meeting of London members. "Formation of a London Branch."

Association of Supervising Electrical Engineers.—Saturday, October 27th. 2.30 p.m. Visit to the Bankside control room of the Central Electricity Board.

Physical Society.—Friday, November 2nd. Imperial College of Science and Technology, S.W.7. 5 p.m. Six short papers.

Association of Mining Electrical Engineers (*West Wales Branch*).—Saturday, November 3rd. Y.M.C.A., Swansea. "Civil Engineering at Tir John North." Mr. H. V. Phillips.

Makers' Names Wanted

Jiffy washing machine.

Turnlite hand lamp.

Dura pear switch.

Eko electric drying cabinet.

Notes

The Women's Electrical Exhibition

The Electrical Association for Women is to celebrate its tenth birthday during the week commencing November 12th by an exhibition of electricity for the working woman which will be held at 20, Regent Street, S.W. The exhibition, which will include full-size models of electric working-class kitchens, will be opened by the Marchioness of Reading, and during the week the following lectures will be given:—Monday: "The Work of the London Housing Societies," by the Lady Pentland; Tuesday: "The Need for Better Housing Conditions for Working People and the Part Electricity Can Play," by Mrs. Eleanor Barton; Wednesday: "The Electrical Needs of the Countrywoman," by Mrs. Wintringham; Thursday: "The Working Woman's Kitchen," by Miss Elizabeth Craig; Friday: "Housing and Health," by Dr. Elizabeth Sloan Chesser. Tickets of admission to the lectures can be obtained from Miss C. Haslett, Director of the E.A.W., at the above address.

Forthcoming Dances

Lord Ashfield, the president of the Electrical Industries Benevolent Association, is appealing for the support of everybody electrical in making a great success of the annual ball which is to be held at Grosvenor House, Park Lane, on Thursday, November 22nd. We would urge our readers to make applications for tickets either to the Secretary, Captain J. T. Keeping, at 9, Southampton Street, London, W.C.1, or to the local branch or steward.

The twenty-third annual dance of the Birmingham Electric Club was held at the Grand Hotel, Birmingham, on October 19th, a company of about 470 being present, including many prominent Midland electrical engineers and their wives. The function was held under the presidency of Mr. J. J. Parkinson, A.M.I.E.E., of Birmingham, and each lady present received a small memento of the occasion during supper.

The Society of Automotive Electrical Engineers

Formed by a number of those engaged in the repair and maintenance of the electrical equipment of motor vehicles in the North of England, an open meeting of the Society of Automotive Electrical Engineers was recently held in London, at which Mr. R. Wood, of Huddersfield, who occupied the chair, explained that the purpose of the meeting was to bring the aim and objects of the Society to the notice of all engaged in the design, manufacture, sale, repair, and maintenance of automobile electrical equipment with the idea of securing an increase in the membership. This section of the motor trade had now assumed a very important character, and it was desirable that every possible effort should be made to raise the status of those engaged in it and so inspire greater confidence in the ever-growing motor-using public. There was much to be gained, not only in the direction of social intercourse, but also from the exchange of ideas and experience by means of the reading of papers and discussions thereon. Sections of the Society had already been formed in London, Leeds, Manchester and Sheffield, and it was hoped to organise others in the near future. Full particulars of the Society can be obtained from the hon. secretary, Mr. W. Marshall, West House, Low Moor, Bradford.

The World's Energy Consumption

According to the Bank für Elektrische Unternehmungen, of Zurich, the consumption of electrical energy throughout the world is growing. The production increased in the second half of 1932 and in 1933 and has continued into the current year. Taking the production in 1929 for delivery to actual consumers at 100 per cent. the bank states that the figures for Switzerland were 107 in 1932, 114 in 1933, and 119 in the first half of 1934. The corresponding figures for Germany were 78, 85 and 102; for England, 119, 131 and 150; France, 92, 100 and 103; Italy, 105, 116 and 127; the United States, 86, 88 and 95 respectively. The estimate of the world production was put at 89 in 1932, 94 in 1933, and 106 in the first half of this year. Excluding North America the figures were 97, 106, and 115 per cent. in the three periods respectively. On the whole prices for energy have been reduced since 1929. In many countries the starting of large new works, the construction of which was begun before or at the commencement of the crisis, has brought about an excess in the supply capacity, although the present surplus production will not afford any occasion for apprehension owing to the comparatively low cost of production and the growing demands for electricity for domestic consumption.

The Batti-Wallahs

At the luncheon of the Batti-Wallahs Society at the Hotel Metropole on Tuesday, November 6th, at 12.55 p.m. sharp, Sir R. Burton Chadwick will deliver an address. Sir Burton has spent many years at sea, is a ship owner, and as first Deputy Master of the Honourable Company of Master Mariners is deeply interested in the welfare of seamen.

Appointments Vacant

Electric traction engineer (£608 per annum) for the New Zealand Government Railways.

City electrical engineer for Port Elizabeth, South Africa (salary £1,000 per annum, grade £1,000-£60-£1,300).

Salesman for Southend-on-Sea Electricity Department.

Mains engineer for Willesden Electricity Department.

(See our classified advertisements.)

Our Personal Column

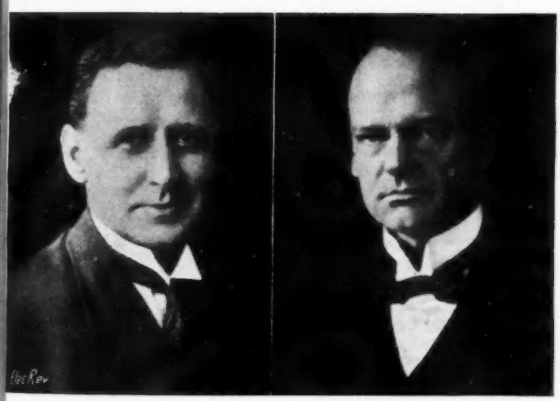
Electrical men are invited to keep readers of the "Electrical Review" posted concerning their movements

Mr. J. C. Lincoln

Mr. J. C. Lincoln, chairman of the Lincoln Electric Co., Cleveland, Ohio, has been awarded the Samuel Wylie Miller Medal by the American Welding Society in recognition of his contributions to the advancement of the science of electric fusion welding. Mr. Lincoln has devoted most of his life to research and the development of the electric arc as an industrial tool. He studied at Ohio State University, receiving a degree in electrical engineering. His electrical activities began in 1888 when he commenced with the Brush Electric Co., some two or three years later joining the Elliott-Lincoln Electric Co., one of the pioneer manufacturers of motors. In 1896 the Lincoln Electric Co. was formed, and was under his proprietorship at first, presidency later, and about 1925 he became chairman of the board. The company built its first welder in 1907.

Mr. T. G. Hewitson, of Sunderland, and **Mr. F. C. Perkins,** of Derby, have been appointed junior charge engineers in the Portsmouth Corporation Electricity Department.

Mr. A. H. Wood has retired from the position of foreman at the Hanwell and Brentford depôt of the Metropolitan Electric Supply Co., and has been presented by his former colleagues with a chiming clock suitably inscribed. The presentation was made at a smoking concert by Mr. W. H. Chapman, chief distribution engineer. Mr. Wood has been forty-six years in the "Metesco" service.

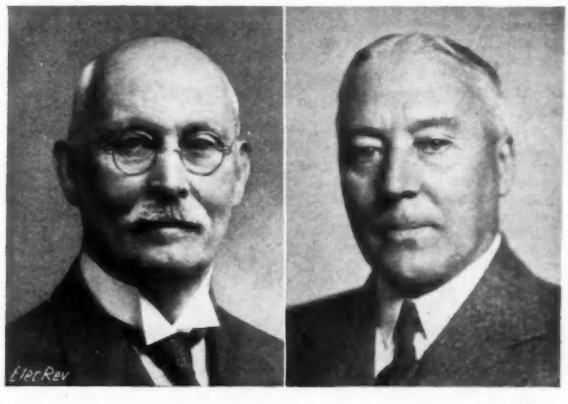


Mr. A. Ramsay, M.P. (left) who has been appointed Director of the Engineering and Allied Employers' National Federation, and Sir Allan Smith who has retired from the chairmanship of the Federation

Mons. Marcel Jobit, the technical director of the Société de l'Accumulateur Fulmen, of Paris, has recently been appointed a member of the French Legion of Honour.

Mr. O. T. David, B.Sc., who is on the engineering staff of Messrs. Allen West & Co., Ltd., was married at Brighton on Saturday last to Miss Myfanwy Hooson.

Mr. A. C. Hill has been appointed as the Southern Counties representative for Messrs. J. H. Tucker and Co., Ltd., as from October 22nd, in succession to the late Mr. G. E. Gibson. Mr. Hill has been associated with the electrical trade in this area for many years as representative of Messrs. Baxter & Caunter, Ltd., Credenda Conduits, Ltd., the Simplex Electric Co., Ltd., etc.



[*Haines* [*Elliott & Fry*

Messrs. Ll. B. Atkinson and W. B. Woodhouse, principal British delegates to the I.E.C. Conference at Prague. **(See page 566)**

Mr. W. Ibeson, engineering master at the Widnes Technical College, has been appointed principal of that college. He was formerly on the staff at the Longroyd Bridge power station, Huddersfield.

Mr. H. A. White, managing director of Marconi's Wireless Telegraph Co., Ltd., who underwent an operation in a London nursing home on Saturday last, is now progressing favourably.

Mr. W. Arvon Wales, B.Sc., A.M.I.E.E., late Professor of Electrical Engineering at the Madras University, is commencing practice as a consulting engineer. His office address is at 33, Chandos House, Buckingham Gate, S.W.1, and he asks for catalogues, &c.

Obituary

Lady Petter.—The death occurred on October 18th, after an operation, of Lady Petter, wife of Sir Ernest W. Petter.

Will.—Mr. J. H. Clarkson, director of the Barlborough Electric Light Co., left £4,887 (net personalty £263).

Photoelectric Cells

A THIRD edition has recently been published of "Photoelectric Cells" by N. R. Campbell and D. Ritchie (Sir Isaac Pitman & Sons, 12s. 6d. net). The preface to the new edition states that the authors have written a new book, with a new purpose, addressed to a much more highly instructed public," but in anticipating a thorough treatment of the higher branches of the subject, the reader may be disappointed in some parts of the work. The subject-matter is divided into three parts, of which the first, on properties of photoelectric cells, contains five chapters dealing with the theory of photoelectricity and the vacuum, gasfilled, rectifier and conductivity types of cell. The treatment of photoelectric theory is original, but does not possess the clarity of expression essential to a preliminary discussion. In the chapter on the vacuum emission cell good use is made of curves illustrating the comparative properties of the various light-sensitive metals and the modifications introduced by sensitisation and the use of thin films. The description of threshold and work function would no doubt have been much simplified, and abbreviated, by following the classical representation due to Einstein, instead of endeavouring to dispense with mathematical formulæ, which are freely introduced elsewhere where they are less necessary. The chapter on the gasfilled cell is prefaced by a concise account of ionisation by collision, leading to the idea of "gas factor," by which the authors designate the ratio of current increase due to the presence of the gas. In view of the promise of the comparatively new rectifier types of cell (developed under the name of "Sperrschicht" on the Continent), the amount of space devoted to them is insufficient. Conductivity cells are dismissed in ten pages, without any account of the work of D'Albe, upon which the modern theory of photoconductivity is based. The four chapters comprising part 2 of the book, on the use of photoelectric cells, deal with general principles, measurements of photoelectric currents, valve amplification, and special methods. The chapter on general principles virtually consists of a much too brief statement of the principles of measurement, applicable mainly to photometry. The chapter on current measurement is comprehensive, and includes practical notes which will save the inexpert experimenter from many difficulties. The chapter on valve amplification contains very few diagrams, but the information given is well chosen and will serve as an introduction to the more complex circuit arrangements which find applications in practice. The importance of the thyratron (or gasfilled relay) as an amplifier of photoelectric currents justifies greater attention.
clear. Some of the reference lists appended to the chapters should be extended in future editions. Although the detailed treatment of many important aspects is somewhat inadequate due to compression, the book will be of value to all concerned with photocell technique, and the reduced price should have a considerable effect upon its circulation in the numerous branches of photoelectric practice.

Financial Section

New Companies, Returns of Share Capital, Debenture Charges, Reports of Electrical Companies, Dividend Changes, Transactions in Stocks and Shares

New Companies Registered

Gambrells, Rowse & Snoaden, Ltd.—Private company. Registered October 15th. Nominal capital, £105,000 in 100,000 ordinary shares of £1 each and 100,000 deferred shares of 1s. each. Objects: To carry on the business of telegraph and telephone engineers, manufacturers, and suppliers of all kinds of electrical apparatus and machines, apparatus and appliances for communication, navigation and other purposes, scientific instrument makers, radio engineers, manufacturers of radio beacon and direction finder equipment, &c. The subscribers are: P. B. Snoaden, 14, Monksdene Gardens, Sutton, Surrey; and W. H. Felling, 4, Moreland Court, Finchley Road, N.W.2. Secretary: W. H. Felling.

Towyn, Aberdovey & District Electricity Co., Ltd.—Public company. Registered October 18th. Capital, £13,000 in £1 shares. Objects: To carry on the business of an electric light company in all its branches and that of electricians, mechanical engineers, manufacturers and workers of and dealers in electricity, &c. The first directors are: Dr. J. A. Davies, Morannedd, Towyn, Merioneth, and six others. Solicitors: Litchfield & Kusel, Palace Chambers, Bridge Street, Westminster.

Maitland Radio Services, Ltd.—Private company. Registered in Edinburgh October 16th. Capital, £2,000 in 1,000 preference and 1,000 ordinary shares of £1 each. Objects: To acquire the business of the Maitland Radio Service carried on by F. J. Zickel at 4, West Maitland Street, Edinburgh, and to carry on the business of manufacturers, importers and exporters of, dealers in and agents for the sale and purchase of all kinds of electrical, musical and other instruments, &c. The directors are: F. J. Zickel, 11, Albion Road, Edinburgh; and J. A. Nichol, 37, Watson Crescent, Edinburgh. Registered office: 4, West Maitland Street, Edinburgh.

Northern Relay Co., Ltd.—Private company. Registered October 15th. Capital, £1,000 in £1 shares. Objects: To carry on the business of wireless relay services, &c. P. Kemp Lee, 4, Lawson Street, Barrow-in-Furness, is the first director. Registered office: 4, Lawson Street, Barrow.

Walker & Wileman, Ltd.—Private company. Registered October 15th. Capital, £1,000 in £1 shares. Objects: To carry on the business of electrical, general and mechanical engineers, erectors or maintainers of electrical installations and plants of all kinds, wireless apparatus makers, dealers and agents, &c. The first directors are: A. Walker, A.I.E.E., Highfield, Ashby Road, Woodville, near Burton-on-Trent; and B. H. Wileman, Station Road, Woodville. Secretary: Miss M. S. Walker, Highfield, Ashby Road, Woodville.

Wireless-on-Tap, Ltd.—Private company. Registered October 11th. Capital, £1,000 in £1 shares. Objects: To establish and develop broadcast relay services. The subscribers are: R. R. Goding, 30, Lodge Drive, Palmers Green, N.13; and Miss Phyllis Taylor, 77, Carleton Road, N.7. R. R. Goding is managing director. Registered office: 56, Marchmont Street, W.C.1.

Basinghall Electric Co., Ltd.—Private company. Registered October 15th. Capital, £2,500 in £1 shares. Objects: To acquire the business of an electrical engineer and contractor now carried on by John R. Lauder at 29, Basinghall Street, E.C. The permanent directors are: J. R. Lauder, A.M.I.E.E., 113, Dowanhill Road, Catford, S.E.6; and T. Ellis, B.Sc., A.M.I.E.E., 97, Hervey Close, Finchley, N.3. Solicitors: Scott & Hellyar, 35, New Broad Street, E.C.

Battery Factors, Ltd.—Private company. Registered October 15th. Capital, £10 in £1 shares. Objects: To carry on the business of dealers in, importers and exporters of or agents for batteries, cells and accumulators, sound recording and reproduction apparatus, &c. The directors are: A. Gatland, 46, Howard Road, Bromley, Kent; and A. E. Day, 15, Howard Road, Tottenham, N.15. Registered office: 32, Bishopsgate, E.C.

Reeser Radio, Ltd.—Private company. Registered October 16th. Capital, £400 in £1 shares. Objects: To carry on the business of retail dealers in, agents for and importers and exporters of radio, television and electrical apparatus, gramophones, &c. The directors are: A. C. Hooker, "Byde-a-Wee," Mill Lane, High Salvington, Worthing, and two others. Registered office: Arundel House, Liverpool Gardens, Worthing.

Metropole Electrical, Ltd.—Private company. Registered October 10th. Capital, £300 in £1 shares. Objects: To carry on the business of manufacturers of and dealers in electrical fittings of all kinds, wireless apparatus and appliances, &c. The directors are: H. K. Taylor and Mrs. May Taylor, both of 24, Highfield Road, Moseley, Birmingham. Registered office: 3, Woodbridge Road, Moseley, Birmingham.

United Electric Stores (Walworth), Ltd.—Private company. Registered October 17th. Capital, £100 in £1 shares. Objects: To carry on the business of manufacturers of and dealers in gramophones and sound-reproducing machines, electric accumulators and batteries and wireless aerials, radio and electrical engineers, &c. The subscribers are: W. T. Robins, 119, Harland Avenue, Sidcup; and H. C. Wells, 19, Romola Road, Herne Hill, S.E.24. Secretary: W. T. Robins. Registered office: 172, Walworth Road, S.E.17.

Drumm Battery Sales, Ltd.—Private company. Registered in Dublin October 15th. Capital, £5,000 in £1 shares. Objects: To carry on the businesses of electrical engineers, contractors, manufacturers of and dealers in railway, tramway, roadway, electric, magnetic, galvanic, and other apparatus, mechanical engineers, &c. The subscribers are: N. McLaughlin, 27, Eglington Road, Donnybrook, Dublin; and M. J. Curley, "Saint Anne's," St. Mary's Avenue, Rathfarnham, Dublin.

Service Sales, Ltd.—Private company. Registered in Dublin October 2nd. Capital, £100 in £1 shares. Objects: To carry on the business of manufacturers of and dealers in wireless sets of all kinds, &c. The subscribers are: D. McKay Johnstone and P. J. Dempsey, both of 24, Nassau Street, Dublin. Secretary, W. J. Adams, 24, Nassau Street, Dublin.

Radio Services Co. (Reading), Ltd.—Private company. Registered October 5th. Capital, £500 in £1 shares. Objects: To carry on at 463, Oxford Road, Reading, the business of electrical, mechanical, wireless, telephone, lighting, heating and general engineers, &c. The directors are: J. Keep (chairman), 36, Wilton Road, Reading, and two others. Solicitors: Sarjeant, Brown and Brown, Reading.

W. E. Burgess (Porthcawl), Ltd.—Private company. Registered October 3rd. Capital, £100 in £1 shares. Objects: To carry on the business of electricians, radio and electrical engineers, contractors, armature winders, metal and alloy makers, &c. The directors are: W. E. Burgess (permanent managing director) and Mrs. Enid J. Burgess, both of Ivy Cottage, New Road, Porthcawl. Solicitor: O. Glyn Davies, 2, Adare Street, Bridgend, Glam.

Halford Distributors, Ltd.—Private company. Registered October 3rd. Capital, £100 in £1 shares. Objects: To carry on the business of manufacturers of and retail dealers in radio sets, &c. The subscribers are: A. W. Simmons and F. G. Watts, both of 9, Carlos Place, W.1. Solicitors: Forsyte, Kerman & Phillips, 9, Carlos Place, Grosvenor Square, W.1.

Surrey Radio Services, Ltd.—Private company. Registered October 3rd. Capital, £500 in £1 shares. Objects: To carry on the business of importers and exporters of, agents for and wholesale and retail dealers in radio, wireless, television and electrical apparatus, &c. The first directors are: J. C. Arnell, "White House," Rosehill Park West, Sutton, Surrey; and P. G. West, 11, Montana Road, Wimbledon, Surrey. Registered office: White House, Rosehill Park West, Sutton, Surrey.

City Relay Services, Ltd.—Private company. Registered October 4th. Capital, £2,000 in £1 shares. Objects: To carry on the business of wireless relay service proprietors, &c. The first directors are: A. Duckett, 16, Grosvenor Street, Colne, and five others. Registered office: 24, New Chapel Street, Mill Hill, Blackburn.

Pocklington Relay Services, Ltd.—Private company. Registered October 6th. Capital, £750 in £1 shares. Objects: To carry on the business of electrical, radio and general engineers and to construct and use stations and offices for relaying radio or wireless programmes, &c. The permanent directors are: E. Lee and Mrs. Elsie L. Lee, both of 8, St. Peter's Square, Pocklington. Solicitors: Summerson & Heninghem, Pocklington.

Force Electric Products, Ltd.—Private company. Registered October 13th. Capital, £200 in £1 shares. Objects: To carry on the business of electricians, electrical engineers, manufacturers, importers, exporters of radio apparatus and appliances, &c. The directors are: E. H. Force, 185, Burnt Oak Lane, Sidcup, Kent, and H. F. Withy, 69, Curzon Street, W.1. Registered office: 329, High Holborn, W.C.1.

Victor Lamps, Ltd.—Private company. Registered October 20th. Capital, £3,000 in £1 shares (2,500 6 per cent. redeemable cumulative preference and 500 ordinary). Objects: To carry on the business of manufacturers of and dealers in wire filament, carbon filament and other electric lamps, &c. The subscribers are: C. Buckley, Corunna, Cobham, Surrey, and Hilda E. Ready, 34, Crichton Road, Carshalton. Secretary: Hilda E. Ready.

W. P. Slaney & Co., Ltd.—Private company. Registered October 20th. Capital, £500 in £1 shares. Objects: To carry on the business of manufacturers and wholesalers of and agents for the supply of all kinds of radio instruments, and electrical goods, &c. The first directors are: W. P. Slaney, 6, Wheatley Avenue, Kirkby-in-Ashfield, Notts, and W. Clarke, 22, Station Street, East Kirkby, Notts. Registered office: 56, Station Street, East Kirkby, Notts.

Lamp Patents, Ltd.—Private company. Registered October 20th. Capital, £1,500 in 750 "A" ordinary and 750 "B" ordinary shares of £1 each. Objects: To acquire any licences, concessions and the like appertaining to British, Colonial and foreign patents, and to carry on the business of inventors and manufacturers of, dealers in and agents for all kinds of incandescent electric light bulbs, &c. The first director is C. Latham, address not stated.

General Transformer Co., Ltd.—Private company. Registered October 20th. Capital, £1,000 in £1 shares. Objects: To carry on the business of manufacturers of and dealers in transformers, dynamos, motors, armatures, magnetos, batteries, &c. The subscribers are: C. H. Warbey, 9, Pembury Road, Tottenham, N.17, and two others. Registered office: 20A, Pennack Road, Peckham, S.E.15.

R. H. Boyland & Co., Ltd.—Private company. Registered October 20th. Capital, £2,500 in £1 shares (1,250 5 per cent. preference). Objects: To acquire the business of electrical engineers carried on by Reginald H. Boyland and John Fleming, at 8, Sedley Place, Oxford Street, W.1. The directors are: R. H. Boyland, 17, Meadow Way, Eastcote, Ruislip, Middlesex, and two others. Registered office: 8, Sedley Place, Oxford Street, W.1.

Southern Radio Contracts, Ltd.—Private company. Registered October 19th. Capital, £1,000 in £1 shares. Objects: To carry on the business of manufacturers and hirers out of and dealers in wireless receiving sets, sound reproducing machines, &c. The directors are: H. R. Somper, Brenzett, The Glave, Kings-

wood, Surrey, and J. Joseph, 16, Cutter Street, Bishopsgate, E.C. Registered office: 63, Queen Victoria Street, E.C.4.

Durham County Relay Service, Ltd.—Private company. Registered October 16th. Capital, £2,000 in £1 shares. Objects: To construct and maintain wireless signal stations, &c. The directors are: F. G. Ferrier, 4, Dunstable Road, Luton, and three others. Registered office: 93, Hayes Road, Clacton-on-Sea, Essex.

Returns of Electrical Companies

Devon Development, Ltd.—C. E. B. M. Smith, chartered accountant, 1, Athenæum Terrace, Plymouth, was appointed receiver and manager on October 10th, 1934, under powers contained in instrument dated June 5th, 1934.

W. H. Bramall & Co., Ltd.—Debenture, dated October 5th, 1934, to secure £2,000, charged on the company's property, present and future, including uncalled capital. Holder: Mrs. I. T. Napier, Eller House, Barkers Lane, Ashton-on-Mersey.

Radiomes, Ltd.—Debenture, dated October 1st, 1934, to secure £2,500, charged on the company's undertaking and property, present and future, including uncalled capital. Holder: C. J. Band, High Street, Coventry.

Wembley Relay Service, Ltd.—Issue on October 5th, 1934, of £500 debentures, part of a series already registered.

Violite, Ltd. (old company).—J. R. Pullan, 49, Marlborough Hill, N.W.8, ceased to act as receiver on September 28th, 1934.

Lesofsky, Ltd.—A. Donner, 72, Margaret Street, W.1, ceased to act as receiver on October 10th, 1934.

L. R. Supply Co., Ltd.—Satisfaction to the extent of £400 on September 26th, 1934, of debentures authorised February 12th, 1934, and registered February 15th, 1934. (According to the register of mortgages, the debentures registered February 15th, 1934, originally secured £1,000.)

Birmingham and District Investment Trust, Ltd.—Satisfaction in full on or before January 3rd, 1934, of trust deed dated June 14th, 1904, and registered June 21st, 1904, securing £200,000 4½ per cent. first mortgage debenture stock, with power to issue further stock ranking, *pari passu*, up to an amount not exceeding half the subscribed capital.

Notts and Derby Radio Relays, Ltd.—The nominal capital has been increased by the addition of £2,000 in £1 ordinary shares beyond the registered capital of £5,000.

Erlco (Electrical Services), Ltd.—Capital, £4,000 in £1 shares. Return dated July 6th, 1934. 2,722 shares taken up. £1,522 paid. £1,200 considered as paid. Mortgages and charges, nil.

E. K. Cole, Ltd.—Capital, £500,000 in 800,000 ordinary shares of 5s. and 300,000 7 per cent. cumulative participating preferred ordinary shares of £1. Return dated July 26th, 1934. 745,600 ordinary and 184,480 preferred ordinary shares taken up. £270,220 paid on 342,960 ordinary and 184,480 preferred ordinary shares. £100,660 considered as paid on 402,640 ordinary shares. Mortgages and charges, nil.

Tungstone Accumulator Co., Ltd.—Capital, £1,000 in £1 shares. Return dated August 10th, 1934. 500 shares taken up. £500 paid. Mortgages and charges, nil.

Bowyer-Lowe & A.E.D., Ltd.—Capital, £5,000 in £1 shares. Return dated July 14th, 1934. 4,515 shares taken up. £4,502 10s. paid, leaving £12 10s. calls unpaid. Mortgages and charges at date of return, nil. Since registered, deed of indemnity dated August 14th, 1934, to secure all moneys not exceeding £600 payable under a guarantee to bankers.

Flinders (Wholesale), Ltd.—Satisfaction to the extent of £1,303 on June 25th, 1934, of trust deed dated November 23rd, 1932, and registered December 2nd, 1932, securing £15,000 debenture stock. (Notice filed October 13th, 1934.)

Earl Manufacturing Co., Ltd.—Particulars filed of debentures not exceeding £5,000, authorised October 11th, 1934, charged on the company's property, present and future, including uncalled capital, the amount of the present issue being £5,000.

D.F.J. (England), Ltd.—The nominal capital has been increased by the addition of £6,500 in £1 shares beyond the registered capital of £1,000.

Callender's Share & Investment Trust, Ltd.—Satisfaction in full on May 31st, 1934, of trust deed dated May 30th, 1912, and registered June 18th, 1912, securing £115,000 debenture stock. (Notice filed October 19th, 1934.)

John Weech, Ltd.—Satisfaction to the extent of £2,000 on October 11th, 1934, of charge dated March 9th, 1931, and registered March 14th, 1931. (According to the register of mortgages, the charge registered March 14th, 1931, originally secured £2,000.)

Wilrose Company (Birmingham), Ltd.—H. Gompertz, 45, Newhall Street, Birmingham, was appointed receiver and manager on October 12th, 1934, under powers contained in 1st mortgage debenture dated August 11th, 1933.

City Notes

The **Central Electricity Board.**—The list was opened on Friday last for the issue of £6,000,000 of Central Electricity 3½ per cent. stock at £93 per cent., mentioned in our last issue. The stock will be redeemed by a cumulative sinking fund, commencing not later than 1940. Any stock not previously redeemed will be repaid at par on May 1st, 1994, but the Board reserves the right to redeem it at par after May 1st, 1974. The new stock will rank, *pari passu*, with all the other stocks of the Board. The proceeds of the present issue will be used to provide further funds for the construction and acquisition of main transmission lines, the cost of standardisation of frequency, working capital and other authorised purposes, including payment of interest on the stocks already issued so far as it is payable out of capital and on the stock now being issued until December 31st, 1941. So heavy was the demand for the new stock that the lists were closed on the morning of the day of issue.

The Kalgoorlie Electric Power & Lighting Corporation has decided to issue 49,990 ordinary shares of 10s. each at 14s. per share. Shareholders are offered the new shares on the basis of one new share for every four ordinary shares held. The new shares will rank for dividend, *pari passu*, with the existing ordinary shares. The company has decided to install a new 5,000-kW turbo-generator, together with the necessary auxiliary plant, in order to meet the increased demand for electricity and to provide efficient reserve plant. The estimated cost of the new plant is £40,000.

The Perak River Hydro-Electric Power Co., Ltd., reports a revenue for the year ended July 31st last of £116,454, as compared with £51,507 in the preceding year. The directors state that the steps taken to increase revenue, which only began to show results at the end of the financial year, together with an increase in permitted output under the tin control scheme, have resulted in a considerable increase in revenue, which is being maintained. Interest and sinking fund charges totalled £116,294 (against £107,337), leaving a net balance of £159, the debit brought in is thus reduced to £39,500.

Erinoid, Ltd., reports a trading profit for the year ended July 31st last of £53,136, as compared with £48,034 in the preceding year. It is proposed to pay a dividend for the year of 11½ per cent., less tax (same, but on increased capital), and to carry forward £8,444.

Radio Central Exchanges, Ltd., held its annual meeting on October 22nd, when Mr. A. B. Winch (chairman), who presided, said that the number of their subscribers had increased by 55 per cent. in the nine months covered by the accounts. The principal centres of activity had been in South Wales and Lancashire. So far the knowledge of the principles of relaying had been largely confined to the particular areas in which it had been working for some time, but greater national publicity might soon be desirable. The number of subscribers all over the country had increased from 22,000 in December, 1930, to 151,000 in 1934, equivalent to approximately 750,000 listeners.

The Cawnpore Electric Supply Corporation, Ltd., has announced an interim ordinary dividend of 3 per cent. (unchanged).

Companies Struck Off the Register.—The names of the following companies have been struck off the Register and they are thereby dissolved:—A.F.M. Electrical Service, Ltd., Jesmond Electrical & General Engineering Co., Ltd.; Lewisham & District Electric Supply Co., Ltd.; Northern Refrigeration & Electrical Co., Ltd.

Companies to be Struck off the Register.—The names of the following companies will be struck off the Register at the expiration of three months unless cause is shown to the contrary:—Camden Electric, Ltd.; Distributors (British Electrical), Ltd.; Eastern Electric Sound System, Ltd.; Mobilectric, Ltd.; Regional Radio, Ltd.; Rowmal Radio & Trading, Co., Ltd.; Tee-Kay Radio, Ltd.; Voltron Electric, Ltd.

The Ever Ready Co. (Great Britain), Ltd., has declared an interim ordinary dividend of 10 per cent. (unchanged). An issue of 440,000 ordinary 5s. shares was made last February, and these shares rank for the dividend now announced. The sales for the period from April 1st have been more than maintained.

The Ever Ready Trust Co. has declared an interim dividend of 3 per cent. on both the ordinary and deferred shares. A year ago the interim distribution was equivalent to 2⅝ per cent.

The Para Telephone Co. reports a net profit of £5,355 for 1933, as compared with £7,332 in the preceding year, to which is added £1,182 brought in. The final dividend is 1½ per cent., making 3½ per cent. for the year (against 5 per cent.), and £1,173 is carried forward.

The Electrolytic Zinc Co. of Australasia reports a net profit for the year ended June 30th last, after providing £145,000 for amortisation and depreciation and £32,337 for taxation, of £234,797, as against £223,093 in the preceding year.

Broadcast Relay Service, Ltd., has announced an interim ordinary dividend of 9 per cent. (against 8 per cent.). The capital was increased by one-fifth in September last.

The Madras Electric Supply Corporation, Ltd., has declared an interim ordinary dividend of 2½ per cent., tax free (same).

The Urban Electric Supply Co., Ltd., is maintaining its ordinary interim dividend at 3 per cent.

Stocks and Shares

TUESDAY EVENING.

THE Central Electricity Board offered last week six million pounds of 3½ per cent. stock, dated 1974-1994, at 93. In spite of the substantial amount, the subscription lists closed almost immediately. The stock offers a flat yield of 3½ per cent. on the money. In spite of the fact that the stock is not included among trustee securities, the investment is perfectly secure.

The question becomes more pressing, by the way, as to why these public boards' stocks should not be admitted to the circle of securities into which trustees are allowed to place money. There is a rigid ring formed round the stocks which have been included hitherto to the trustee list, with the result that prices of such stocks stand at very high figures. The throwing-open of the list to allow inclusion of such issues as those of the Central Electricity, the London & Home Counties, and several other public boards' stocks of similar character, would give the trustee a wider choice, and at the same time tend to keep the prices of gilt-edged issues upon a more reasonable plane.

In point of actual fact, however, the ordinary investor, not a trustee, is so well aware of the security which these public boards' stocks afford, that the difference in yield between

these stocks and those which are included in the trustee list, is gradually narrowing.

An Amended Electricity Scheme

The price of the new scrip opened at 10s. premium. It quickly rose to 13s. 8d. premium. The Central Electricity Board during the past week has published an amended plan received from the Electricity Commissioners for the South West England and South Wales Electricity District. The District covers an area of 17,000 square miles, and the scheme introduces a number of important alterations. Those people who are interested in its financial side will see in it the possibility of further substantial issues of stock to be made within the next few years. London Passenger Transport "C," the speculative investment of the group, holds its price of 86½, and the other quotations are all very steady.

Electricity Supply Shares

Midland Electric Power shares have risen 1/16 to 45s., at which price the return on the money comes to a little over 3½ per cent. Midland Counties return 3¾ per cent. at their present price, and Yorkshire Electric 3 7/16 per cent. Electric Distribution of Yorkshire pay 3½ guineas per cent., and in spite of the modesty of these returns there is a continued demand for all the electricity supply shares, London and provincial alike, at to-day's prices. Edmundson's preference at 36s. are 1s. higher. Urban Electric Supply Company has declared its usual 3 per cent. interim dividend on the ordinary shares, payable on November 1st.

Victoria Falls and Transvaal Power Co. shares, in the Colonial group, have recovered to 6 5/16, notwithstanding a generally weak tendency that has overtaken South African mining shares. The Kalgoorlie Electric Power & Lighting Corporation is offering 49,990 ordinary shares of 10s. at 14s. per share, the money being required for the installation of more plant. The new shares are offered by way of rights, one new for every four ordinary shares now held. The new shares will rank for dividend with the existing ordinary. The price of the latter is about 15s., so it can hardly be said that the company is treating its shareholders with extravagant generosity.

Cables and Wireless

The hope that Cables & Wireless would be able to publish improved figures in respect of September earnings has been fulfilled, the index number of 73.3 comparing with 67.9 for September last year. Some people were looking, however, for better traffics. The August index number was a shade higher than that for September, but August has one extra day, and this accounts for the difference. That there is still plenty of room for improvement no one will controvert, but the figures imply a quiet expansion in business. Cables preference put on 10s.: the "A" ordinary is similarly lower. Indications from various official sources hint plainly enough at the likelihood of reduction in taxation next April, and, with industrial conditions on the mend, the Cables & Wireless Combine should make steady headway. Great Northern Telegraphs have gone back to 36. The Anglo-American stocks are rather better, but, on the other hand, American Telephone & Telegraph common stock, at 112½, has lost the 2 points which it gained a week ago. Stock Exchange attention has noted with lively interest the Postmaster-General's action in regard to television. Lord Selsdon and three other members of the Committee appointed by the Postmaster-General have gone to New York this week in order to study television developments in the United States.

Manufacturing and Equipment

Active business is taking place in the shares of the principal electricity supply companies. That there are not many quotable changes in the prices is due to the fact of the shares being, generally speaking, in short supply. Buyers are anxious to obtain stock, but for their own sakes have no wish to put up prices against themselves. Enfield Cables have spurted to 93s. 9d. Henleys are ⅛ up at 6⅝. Telegraph Constructions have come further into the limelight, and there has been a keen demand for Reyrolles up to 54s. Aron Electricity ordinary are 2s. higher at 72s. International Automatic Telephones at 37s. show a reaction of 1s. 6d., and the deferred have gone back to 36s., profit-taking being responsible for the decline. Ever-Ready shares are steady at 27s. The company intimates, with the announcement of interim dividend payments, that the sales for the period from April 1st last have been more than maintained.

Miscellaneous Matters

British Electric Traction deferred has continued its extraordinary advance; the price at 845 is 45 higher on the week. The 8 per cent. preferred ordinary has put on 2 points. Foreign issues have sympathised with a heavy tone that characterised most of the Stock Exchange markets outside those concerned with gilt-edged securities. No changes of consequence have taken place, however, in the Latin-Canadian group of utility companies.

With regard to the Home iron and steel trade, improvement is still marked. Babcock & Wilcox at 43s. are ex the increased interim dividend. The rubber share market presents few points of interest. Business in most of the Stock Exchange markets is still disappointing those who had looked for animation developing in the early autumn.

Share List of Electrical Companies

		Nom.	Dividend. 1932.	Dividend. 1933.	Price. Oct. 23.	Rise or Fall.	Yield. £ s. d.
Home Electricity Companies.							
Bournemouth and Poole		1	15	15	78/9	—	3 16 2
Brompton Ordinary		1	7	7	34/6	—	4 1 2
Charing Cross Ordinary		1	7	7	35/–	—	4 0 0
Chelsea		1	7	7	34/6	—	4 1 2
City of London		1	7½	7½	36/–	—	4 3 4
Clyde Valley		1	7	7	2	+6d.	3 10 0
County of London		1	10½	10½	57/–	–6d.	3 13 8
Edmundson's 7% Pref.		1	7	7	36/–	+1/–	3 17 9
Elec. Dis. Yorkshire		1	9	9	49/–	—	3 13 6
Elec. Supply Corporation		1	11	11	58/9	—	3 14 10
Kensington Ordinary		1	7	7	34/6	—	4 1 2
Lancs Light and Power		1	7	7½	37/6	—	4 0 0
London Electric		1	7	7	34/6	—	4 1 2
Metropolitan		1	10	10	53/6	—	3 15 6
Midland Counties		1	7	7	37/6	—	3 14 8
Mid. Elec. Power		1	8	8	45/–	+ 1/8	3 11 1
North Eastern Electric Ordinary		1	6	6	33/6	—	3 11 8
Do. 7% Pref.		1	7	7	35/–	—	4 0 0
Northampton		1	10	10	55/–	—	3 12 9
Notting Hill 6% Pref.		10	6	6	14¼	—	4 4 4
North Met. Elec. Ordinary		1	10	10	3½	—	3 1 6
Do. do. 6% Pref.		1	6	6	31/6xd	—	3 16 2
St. James' and Pall Mall		1	7	7½	36/6	—	4 2 2
Scottish Power		1	8	8	41/6	—	3 17 2
South London		1	7	7	35/6	—	3 19 0
Westminster Electric		1	7	7	34/6	—	4 1 2
Whitehall Elec. Invst. 7½% Pref.		1	7½	7½	22/–	—	6 16 4
Yorkshire Elec.		1	8	8	46/6	—	3 8 8
Public Boards.							
Central Electricity, 1950–70	Stock		5	5	115	—	4 7 0
Do. 1955–75	,,		5	5	117	—	4 5 6
Do. 1951–73	,,		4½	4½	110	—	4 1 10
Do. 1963–93	,,		—	3½	101	—	3 9 4
London & Home Counties, 1955–75	,,		4½	4½	112	—	4 0 4
London Passenger Transport, A	,,		—	4½	121½	—	3 14 0
Do. do. B	,,		—	5	125½	—	3 19 6
Do. do. C	,,		—	3	86½	—	3 9 5
West Midlands Joint Elec. 1948–68	,,		—	5	115	—	4 7 0
Telegraph and Telephones.							
American Tel. & Tel.	$100		9	9	112½	–2	8 0 0
Anglo-Am. Tel. Pref.	Stock		6	6	114xd	—	5 5 2
Do. Def.	,,		1½	1½	27⅜	+½	5 8 1
Cables & Wireless 5½% Pref.	,,		2⅜	2⅜	78½	+½	3 10 1
Do. A. 7½% Ord.	,,		Nil	Nil	17½	–½	—
Do. B. Ord.	,,		Nil	Nil	7½	—	—
Globe Tel. and T. Ord.	10		Nil	2½	9½	–½	2 12 8
Do. do. Pref.	10		6	6	12½	—	4 16 0
Great Northern Tel.	10		20	20	36	–1	5 11 1
Marconi-Marine	1		10	7½	32/6	—	4 12 4
Oriental Telephone Ord.	1		12	12	3½xd	—	*3 16 10
Home and Foreign Trams, Etc.							
Anglo-Arg. Trams First Pref.	5		Nil	Nil	1/6	—	—
Do. do. 2nd Pref.	5		Nil	Nil	1/6	—	—
Do. do. 5% Deb.	Stock		Nil	Nil	6	—	—
British Electric Traction Df. Ord.	,,		5	5	845	+45	—
Do. do. Pref. Ord.	,,		8	8	165½	+2	4 16 10
Brazil Traction	100		—	—	12	—	—
Brit. Columbia Elec. Rly. Pce.	Stock		5	5	106	+1	4 14 3
Mexico Trams, 5% Bonds	—		5	5	17⅞	—	—
Mexican Light Common	100		Nil	Nil	2½	—	—
Do. 7% Pref.	100		7	7	4½	—	—
Do. 1st Bonds	—		5	5	38	—	—
Victoria Falls Ord.	1		15	20	6 5/16	+ 1/16	3 1 0
Yorkshire (West Riding)	1		2½	5	25/–	—	4 0 0
Manufacturing Companies.							
Aron Electricity Ord.	1		10	10	72	+2/–	2 15 7
Assoc. Elec. Ord.	1		4	3	22/–	—	2 14 7
Do. Prf.	1		8	8	32/6	—	4 18 6
Babcock & Wilcox	1		9	6	43/0xd	—	2 15 8
British Aluminium Ord.	1		5	5	29/6	—	3 7 9
British Insulated Ord.	1		15	15	76/3	—	3 18 9
Brush Ord.	Stock		Nil	Nil	43	–2	—
Callender's	1		15	15	3 1/16xd	—	4 10 8
Do. 6½% Pref.	1		6½	6½	31/3	—	4 3 2
Crompton Parkinson Ord.	5/–		22½	12½	30/–	—	2 1 8
Do. 8% Pref.	1		8	8	33/9	—	4 14 10
Edison-Swan 1st Pref.	1		7½	7½	22/6	—	6 13 4
Do. 5% Deb.	Stock		5	5	107½	—	4 13 0
Electric Construction	1		Nil	Nil	13/9	—	—
Enfield Cable Ord.	1		25	20	4 11/16	+ 1/16	4 5 1
English Electric	1		Nil	Nil	5/9	—	—
Do. do. Pref.	1		Nil	Nil	10/9	–6d.	—
Ever Ready	5/–		35	35	27/–	—	6 9 8
Ferranti Pref.	1		7	7	28/6	—	4 18 3
G.E.C. Pref.	1		6½	6½	32/6	—	4 0 0
Do. Ord.	1		8	8	45/9	—	3 9 10
Henley's	1		30	30	6⅞	+⅛	4 10 7
Do. 4½% Pref.	5		4½	4½	5⅝	—	3 18 3
India-Rubber Preferred	1		—	—	1	—	—
Johnson & Phillips	1		5	5	30/–	—	3 6 8
Siemens Ord.	1		6½	4	1	—	4 0 0
Telegraph Construction	£1		Nil	Nil	1¼	—	—

* Dividends paid free of Income Tax.

Published Specifications

Compiled expressly for this journal by a firm of chartered patent agents. The numbers in parentheses are those under which the specifications will be printed and abridged, and all subsequent proceedings will be taken

1932

36457. "Bridge or remote electric-control arrangements for electric ship-propulsion systems." General Electric Co., Ltd., and H. J. Coates. December 23rd, 1932. (416974.)

36902. "Imitation fires." General Electric Co., Ltd., and G. W. Barras. January 26th, 1934. (416975.)

1933

4602. "Apparatus for electrically etching or marking articles of metal and the like." W. Taylor and Kapella, Ltd. February 15th, 1933. (Cognate applications 18888/33 and 597/34.) (416924.)

6286. "Luminous discharge tubes." British Thomson-Houston Co., Ltd. March 1st, 1932. (417179.)

8534. "Dynamometric apparatus." A. S. Fitzgerald. March 21st, 1933. (417051.)

8543. "Television systems." L. C. Martin. March 21st, 1933. (417052.)

8776. "Cable communication systems." Standard Telephones & Cables, Ltd. (Western Electric Co., Inc). March 23rd, 1933. (417054.)

8839. "Very short-wave radio communication systems." Marconi's Wireless Telegraph Co., Ltd. April 5th, 1932. (417057.)

8937. "Means for controlling the tone of low-frequency speech currents of sound-reproducing apparatus." Standard Radio Relay Services, Ltd., G. M. O. Jenkins and P. Adorjan. March 24th, 1933. (416982.)

8951. "Heating of liquids by electricity." S. F. Bickell. March 24th, 1933. (417059.)

9054. "Electrical protective relays, indicators, and the like." G. R. Mason and Associated Electrical Industries, Ltd. March 25th, 1933. (416984.)

9082. "Electrical manœuvre signals for motor vehicles." J. Lucas, Ltd., O. Lucas and W. H. Egginton." March 25th, 1933. (416941.)

9143. "Automatic system for switching on wireless sets." A. J. Mombrun. March 27th, 1933. (417061.)

9146. "Electrical signalling systems employing reversible repeaters." Electrical Research Products, Inc. March 31st, 1932. (417062.)

9181. "Telephone systems." Automatic Electric Co., Ltd., R. Taylor, and G. T. Baker. March 27th, 1933. (417064.)

9182. "X-ray apparatus." O. H. Pieper. April 4th, 1932. (417065.)

9333. "Brush-gear for dynamo-electric machines." J. Stone & Co., Ltd., and L. R. Nixon. March 28th, 1933. (417132.)

9355. "Protective arrangement for electric power feeder systems." Pirelli-General Cable Works, Ltd., and R. J. Jordan. March 28th, 1933. (417133.)

9370. "Television." Electric & Musical Industries, Ltd., and C. O. Browne. March 28th, 1933. (417181.)

9448. "Cathode-ray tubes." Standard Telephones & Cables, Ltd., W. T. Gibson, and D. H. Black. March 29th, 1933. (417182.)

9486. "Electrically-operated taximeters for vehicles." J. D. Fouhety. March 29th, 1932. (417069.)

9498. "Protective devices for electric circuits." International General Electric Co., Inc. March 29th, 1932. (Addition 399042.) (417183.)

9662. "Automatic telephone systems." Telefonaktiebolaget L. M. Ericsson. April 1st, 1932. (417189.)

9735/6. "Thermionic valves." North London Valve & B.U.R.T.S., Ltd., and A. E. F. Thomas. March 31st, 1933. (417191/2.)

9782. "Electric welding." A. T. Roberts and Murex Welding Processes, Ltd. March 31st, 1933. (417195.)

9801. "Wireless direction-finding systems." Marconi's Wireless Telegraph Co., Ltd., H. M. Dowsett, and L. E. Q. Walker. March 31st, 1933. (417196.)

9942. "Carrier-current signalling and distant-control systems." General Electric Co., Ltd., and E. P. L. Westell. April 3rd, 1933. (417202.)

9962. "Permanent-magnet moving-coil loudspeakers." H. S. Haring and Magnavox (Great Britain), Ltd. April 3rd, 1933. (416988.)

9990. "Cooling tubes for dynamo-electric machines and methods of manufacturing the same." P. A. H. Mossay and G. J. Scott. April 3rd, 1933. (416990.)

11093. "Electrical indicating and controlling systems." Bailey Meter Co. April 14th, 1932. (417204.)

11590. "High-frequency selective signalling systems utilising power lines." British Thomson-Houston Co., Ltd. April 20th, 1932. (417205.)

11939. "Dynamo-electric machines." H. D. Wheeler and P. A. H. Mossay. April 24th, 1933. (417137.)

12317. "Electric cables." St. Helens Cable & Rubber Co., Ltd., and H. C. Harrison. April 27th, 1933. (417208.)

12426. "Containers for electrical condensers or other electrical devices." Dubilier Condenser Co. (1925), Ltd. (W. Dubilier). April 28th, 1933. (416994.)

13364. "Electric switches for controlling refrigerators." International General Electric Co., Inc. May 7th, 1932. (416996.)

14395. "Acoustic apparatus." A. H. Midgley. May 18th, 1933. (416998.)

15389. "Electric contactors." F. Whyman and Associated Electrical Industries, Ltd. May 27th, 1933. (417001.)

18188. "Gas-blast electric switches." International General Electric Co., Inc. June 25th, 1932. (417214.)

18812. "Electric discharge apparatus." Allmänna Svenska Elektriska Aktiebolaget." July 4th, 1932. (Cognate application 18813/33.) (417215.)

19401. "Electric couplings." W. T. Henley's Telegraph Works Co., Ltd., and H. S. Wheeler. July 8th, 1933. (417077.)

32628. "Timing devices, more particularly for electric motor starting and controlling mechanism." British Thomson-Houston Co., Ltd. November 23rd, 1932. (Cognate application 32629/33.) (417086.)

34870. "Electric remote-control and supervisory apparatus." Siemens & Halske Akt.-Ges. November 13th, 1933. (417018.)

1934

2838. "Electric heating devices, particularly applicable to cooking ovens." Falk, Stadelmann & Co., Ltd., and S. F. Bickell. January 27th, 1934. (417021.)

5906. "Thermionic valves." Telefunken Ges. für Drahtlose Telegraphie. February 22nd, 1933. (417027.)

6260. "Alarm devices for indicating current failure in electric supply systems." Elektrozeit Akt.-Ges. February 25th, 1933. (417030.)

6868. "Spark-plug." Champion Spark Plug Co. January 25th, 1934. (417097.)

7673. "Devices comprising electric discharge tubes." Naamlooze Vennootschap Philips' Gloeilampenfabrieken. April 3rd, 1933. (417033.)

11695. "Electric discharge devices." British Thomson-Houston Co., Ltd. April 18th, 1933. (417036.)

11710. "Thermionic valve systems." W. Baggally. April 18th, 1934. (417236.)

12592. "Installation for the electric killing of whales." Aktieselskapet Elektrisk Hvalskytning. April 26th, 1933. (417037.)

Trade Mark Applications

The following are among the recent applications for British trade marks. Objections against any of the proposed marks may be entered within one month from October 17th:—

Synchromatic. No. 552836. Class 8. Time registering apparatus.—Synchromatic Time Recording Co., Ltd., 47, South Castle Street, Liverpool.

Weblite. No. 549715. Class 13. Electric lamps (ordinary), electric lighting, heating and power fittings, electric contacts and terminals, electric switches (ordinary), sparking plugs and parts of electric cells and batteries, &c.—J. M. Webber & Co., Ltd., 39, Great Eastern Street, E.C.2.

Luxton. No. 553389. Class 13. Electric lighting, heating, and power fittings.—J. Stone & Co., Ltd., Abinger Road, Deptford, S.E.14.

Resibond. No. 552927. Class 50. Material in sheet form composed of paper and synthetic resin, the latter predominating, for use in bonding plywood. Resifilm. No. 552928. Class 50. Material, in sheet form, composed of paper and synthetic resin, the latter predominating, for use in surfacing wood.—Bakelite, Ltd., 63, Victoria Street, Westminster, S.W.1.

Power Radiation

IN a paper published in the I.E.E. *Journal*, Dr. W. E. Sumpner discusses the mode of propagation of energy under steady current conditions and advances the view that it is nothing more than a special case of radio transmission. He seeks to justify the view that the processes at work in steady current systems of power transmission are the same as those involved in radiation, and that the fluxes have the same characteristics as those in a wave of light. This is not the normal view. Maxwell's theory is an electromagnetic theory of light, but does not seem to have been used as an optical theory of electro-magnetic processes. No one appears to have applied to it two principles always admitted about light: (i) the individuality and independence of light waves, and (ii) the production of reflections when light waves are incident on matter.

It seems natural to expect the flux streams due to a steady current supply system to behave in general like those of radiation. What is hard to appreciate is that such a view is consistent with the known facts about the distribution of energy in electrical circuits. The actual mode of transfer of energy through the ether is quite as important to the practician as to the theorist. The engineer deals directly only with matter, but the object of his work is to cause and to control the movement of energy of the type he needs from the place where it can be obtained to the place at which he can use it.

The electromagnetic theory governs all electrical processes, but, while the high-frequency disturbances of light, or radio-telephony, move in waves which are known to retain their individuality when superposed, the principle of independence does not seem to be applied when the disturbances are of very low frequency so as to approach steady current conditions. In the last case the electromagnetic fluxes are, even nowadays, often regarded as static, and when such fluxes are superposed it is generally assumed that they merge into a single flux. Poynting's theorem of energy flow suggested that the fluxes due to steady currents are moving through the dielectric, but tacitly assumed that the fluxes form a single stream, and that nothing of the nature of reflection occurs when this stream reaches a material surface.

It would seem only to harmonise with Maxwell's theory, and with the properties of light, if such streams when incident on matter were to give rise to reflected ones, and therefore to a system of superposed streams. The aim of the paper is to show that such a view is quite consistent with the known distribution of energy to the various parts of the conducting circuit.

New Work for Contractors

Particulars of new works and building schemes for the use of electrical installation contractors and traders

Publication in this list is no guarantee that electrical work is definitely included. Alleged inaccuracies should be reported to the Editors.

Aberystwyth.—Houses (38); Jenkin Davies, builder, Maesteg.

Ardsley.—Houses (70), Blackgates Estate (direct labour materials only); F. A. Brown, architect, Council Offices, Blackgates School, Tingley, near Wakefield.

Ayrshire.—Schools, Kilmarnock, for County E.C.; education architect, Ayr.

Barnsley.—Houses (308), Darton; borough engineer.

Bexhill-on-Sea.—School and cookery centre (£14,715), for Borough E.C.; director of education.

Birmingham.—Rebuilding of premises, Bennett & Rawson, Ltd., 191, Bradford Street (£20,000); Hartley Smith, Ltd., builders, Wilton Road, Erdington.

Blackpool.—Houses, Colchester Road, Marton; G. & H. H. Whitehead.

Blaydon-on-Tyne.—Houses (30) and shops; A. W. Archer, architect, Rowlands Gill.

Blyth.—School (£11,500); L. Leeper, borough engineer.

Bolton.—Technical college, Manchester Road (competition); Bradshaw Gass & Hope, architects.

Bournemouth.—Factory, Holdenhurst Road; British Foreign & Colonial Light Controlling Co. Hotel, shops and showrooms, Bourne Avenue; Richmond Chambers, Ltd. Offices, Christchurch Road; General Accident Fire Life Assurance Co., Ltd.

Bradford.—Secondary school, Leaventhorpe Estate, Thornton (£33,200), for E.C.; J. A. Fletcher, city architect, Town Hall.

Brighton.—Houses (212), Manor Farm Estate, and shops, Rottingdean; borough surveyor. Extensions to Dome Buildings (£40,816); Ringmer Building Co., The Broyle, Ringmer.

Buckinghamshire.—Elementary school, Amersham Common, for County E.C.

Cambridgeshire.—Senior schools, Histon-Cottenham (£15,700), and Linton area (£12,400); county architect.

Carlisle.—Bus station, Lowther Street; Ribble Motor Services, Ltd.

Chester.—Senior school, Woods Lane, Cheadle; F. Anstead Browne, architect, The Castle.

Consett.—Houses (250); T. Hutton, U.D.C. surveyor.

Coseley.—Houses (87); U.D.C. surveyor.

Cumnock (AYRSHIRE).—Houses (144), Glaisnock Street; burgh surveyor.

Deal.—School, Mill Road, for Borough E.C. (£24,742); Rice & Son, builders, Margate.

Denton.—Houses (42), Town Lane; J. C. A. Brown, architect, "Withytrees," Mornington Road, Sale.

Durham.—School, Lanchester, for County E.C.; F. Willey, architect, 34, Old Elvet.

Ebbw Vale.—Schools, Glencoed (£11,400), for E.C.; G. Davies, architect.

Edinburgh.—Houses (208), North Saughton Road, for Mactaggart and Mickel, Ltd., 65, Bath Street, Glasgow; Stewart Kaye, architect, 14, Hill Street.

Falkirk.—Houses (70); burgh surveyor.

Gillingham (KENT).—Houses (39), Chalkenden Avenue, for J. F. Eldridge.

Glasgow.—Cinema, Duke Street; Bernard Frutin.

Gosport.—Houses and flats (28); borough engineer.

Gourock.—Entertainment pavilion (£10,000); burgh surveyor.

Grimsby.—Houses (100), Nunsthorpe Estate (£28,364); W. Pinkney.

Halifax (YORKS).—Cinema, Grove Mills, Shelf; W. A. Ross & Son, architects, Bradford.

Hartley Wintney.—Houses (66), Hartley Wintney, Odiham, Hook and Hamley; Council's surveyor.

Hazel Grove and Bramhall.—Cinemas, Bramhall, electrical work; A. Clayton, architect, Wellington Street, Stockport.

Hertfordshire.—Schools, Abbot's Langley, Harpenden, Boreham Wood, St. Alban's Beaumont Estate, Underhill, Barnet, and Welwyn Garden City; county surveyor.

Hetton-le-Hole.—Houses (59); A. H. Fennell, architect, Bridge End Chambers, Chester-le-Street.

High Wycombe.—Houses (22), Downley and Princes Risborough; C. H. Wright, architect, 24, Temple Street, Aylesbury. Senior school (1,000 places) for Borough E.C.; director of education.

Hull.—Secondary school, Pickering Road, for City E.C.; director of education.

Irish Free State.—(ARKLOW, Co. WICKLOW).—Houses (60); J. P. Caffrey, architect, Aughrim. (WEXFORD).—New wing to St. Peter's College; Thomas J. Cullen, architect, 25, Suffolk Street, Dublin.

Kendal.—Houses (72), Glebe Fields; J. S. Bramley, builder. Wakefield.

Kent.—Boys' central school, Northfleet, for County E.C.; education architect, Maidstone.

Lanarkshire.—Houses (60), Carluke, and 20 houses at Greengairs, for C.C.; clerk, Renfield Street, Glasgow.

Leeds.—Out-patients' department (£12,000); Hospital for Women; governors.

Lincoln.—Houses (422), St. Giles' Estate; First National Housing Trust, Ltd., 10, The Boltons, South Kensington, S.W.10.

London.—(BERMONDSEY).—Houses, Redriff Estate (£42,945); Borough Council. (BETHNAL GREEN).—Tenements, Butler Street (£18,433); borough engineer. (BRIXTON).—Elementary school, Vassall Road (£27,925); L.C.C. Education Committee. (CHELSEA).—Extensions to St. Stephen's Hospital (£25,000); L.C.C. architect. Improvements, Sloane Square Station; London Passenger Transport Board. (CLAPHAM).—Houses, Clapham Park Estate (£134,720); L.C.C. Housing and Public Health Committee. (DEPTFORD).—Houses, Bate Place (£12,298); R. J. Rowley, Ltd., Tottenham, N. (E.C.).—Improvement scheme to the Guildhall; Sir G. G. Scott. (ISLINGTON).—Alterations to Caledonian Road baths (£9,400); borough engineer. Alterations to power station (£10,772); Stapleton & Sons, Ltd. (SOUTHWARK).—Rehousing, Rockingham Street area (£80,000); L.C.C. architect. (STEPNEY).—Depôt, Commercial Road (£7,368); borough engineer. (STOKE NEWINGTON).—Houses (307), Seven Sisters Road; Gooderson & Buckley. Works extensions, Shelford Place, for D. & P. Speedy, Ltd.; J. Cannon & Son. (TOOTING).—Extensions to Grove Hospital (£18,857); J. Crewdson, Horley. (WALWORTH).—Rebuilding, 238, Walworth Road; Messrs. Cluttons. (WEST HAM).—Houses (44), Greengate Street; borough surveyor. (WOOLWICH).—Central garage, Plumstead (£10,000), and workshops, Westhorne Avenue (£9,000); borough engineer.

Maldon (ESSEX).—Houses; borough surveyor.

Margate.—Infant welfare centre and school clinic; W. R. H. Gardner, architect, Grosvenor Place.

Middlesex.—Schools, Hanworth (£25,129) and Hampton, for County E.C.; director of education, 40, Eccleston Square, London, S.W.

Mirfield.—Houses (41); U.D.C. surveyor.

Morayshire.—New county offices (£10,000); county clerk, Elgin.

Nailsworth.—Houses (24); U.D.C. surveyor.

Newburn-on-Tyne.—Houses (372), West Denton Estate; R. Burke, architect, 12, Grey Street, Newcastle-on-Tyne.

Newcastle-on-Tyne.—Houses (102), Daisy Hill Estate; R. G. Roberts, housing architect, 18, Cloth Market.

Newcastle (STAFFS).—Police station (£16,163); T. S. Hedley & Sons, Ltd., builders.

Newton-le-Willows.—Institute; H. D. Pritchett, architect, 12, High Row, Darlington.

Nottingham.—Houses (654) and flats, Billborough Estate; E. Phillips, housing architect, Exchange Buildings East, Nottingham.

Oban.—Houses (52), Dalintart; D. Galloway, burgh surveyor, Municipal Buildings.

Oldbury.—Houses (200), Moat Farm and Bleak House Estates; U.D.C. surveyor.

Orpington.—Houses (64); Frank Scrivener & Co., builders, 897, Oxford Road, Reading.

Pontefract.—Houses (102), Monkhill site; Pennington, Hustler & Taylor, architects.

Portsmouth.—Extension to Cathedral (£75,000); Sir Charles Nicholson.

Preston.—R.C. church, Deepdale (£11,000); Thomas Croft & Sons, builders.

Richmond-on-Tees.—Houses (46); R.D.C. surveyor.

Richmond (SURREY).—Houses (66); S. D. Mosse & Sons, builders, Chelmsford. Houses (120); borough surveyor.

Romsey (HANTS).—Houses (68); borough surveyor.

Rotherham.—Public baths and café (£36,000); Major Turner, borough engineer.

Savernake.—Additions, Savernake Hospital (£12,300); Hospital Committee.

Selsdon.—Houses (26), Bordwood Close; H. N. Dering.

South Shields.—High school for boys at Hanton for E.C. (£41,868); Carruthers & Sons, builders, 1, Heugh Terrace.

Stafford.—Houses (58); borough surveyor.

Staffordshire.—School, Cellarhead, for County E.C.; director of education, Stafford.

Stalybridge.—Houses (76); borough surveyor.

Stamford.—Houses (41), Cemetery Road, for Housing Committee (£10,975); J. W. Barber, Peterborough.

Stockton-on-Tees.—Houses (25), Norton Road; A. E. Hobbs, builder, Hill House, Norton.

Stoke-on-Trent.—Secondary school, Thistley Hough, and senior school, Chell, for City E.C.; director of education. Houses (16), Birks Street; Holloway & Co. Houses (34), Occupation Street; F. Gibson.

Sunderland.—Hotel, Seaburn (£15,000); W. Welford, builder, Whitburn, South Shields.

Surrey.—Schools, Banstead, Stoneleigh, and extensions to Guildford County School for Girls, for County E.C.

Swinton & Pendlebury.—Houses (500), Moss Lane and Barton Road; H. Entwisle, surveyor, Council Offices, Swinton.

Teddington.—Factory, Somerset Road (electrically equipped), for Fourfold, Ltd.; G. Wyatt, managing director, 139, Percy Road, Hampton.

Troon.—Houses (52); burgh surveyor.

Tynemouth.—Aerodrome; borough engineer.

Ulverston.—Houses (62); U.D.C. surveyor.

Wallasey.—Houses (52) and flats, Pasture Road (£14,998); Lloyd & Cross, Ltd. Promenade extension (£507,695); Edmund Nuttall, Sons & Co., Ltd.

Wallsend-on-Tyne.—Houses (88), Archer Street; Northern Homes & Estates, Ltd. Houses (424), for slum clearances, and extensions to Central Library and branch library, East End; borough engineer.

Walsall.—Houses (69), Fullbrook Estate; borough engineer.

Warsop.—Houses (44), Sandy Lane; U.D.C. surveyor.

West Hartlepool.—Houses (160); F. Durkin, borough engineer.

West Riding.—School, Ward Green, Worsborough, for County E.C.; director of education, Wakefield. Maternity home, Wickersley (£17,300), for C.C.; County architect, Wakefield.

Weymouth.—Houses (200); borough surveyor.

Willenhall.—Houses (200); U.D.C. surveyor.

Windsor.—Houses (66); Cain & Co., builders, Hounslow.

Winsford (CHESHIRE).—Post office and telephone exchange for H.M. Office of Works, King Charles Street, London, S.W.

Woking.—Houses (42), Westfield, and Knaphill; U.D.C. surveyor. Swimming bath (£20,400); Bolkin & Lakin, Ltd., Birmingham.

Worcestershire.—Reconstruction of Bromsgrove Poor Law Institution (£15,000), for C.C.; A. V. Rowe, county architect, Worcester.

Worthing.—Houses (32); R.D.C. surveyor, 15, Mill Road. School, Lyndhurst Road, for Borough E.C.; education architect, Town Hall.